

September 28, 2017



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RECEIVED

SEP 28 2017

Department of Ecology
Eastern Washington Office

Re: City of Spokane Combined Sewer Overflow (CSO) Annual Report - 2016

Dear Ms. Borgias:

Enclosed for review and approval is the City of Spokane's 2016 CSO Annual Report as required in Section S.13B of the City's 2011 NPDES Permit (WA-002447-3). The 2016 annual CSO overflow volume to the river of approximately 80 million gallons is slightly above average due to record precipitation during October. There was no CSO overflow to Latah Creek in 2016. This report will be posted within a few weeks on the City's Wastewater Management website:

<https://my.spokanecity.org/publicworks/wastewater/cso/>

Annual progress on the City's CSO Reduction Plan, required in S.13D, is reported in Table 3-3 on page 3-5 of the enclosed Annual Report. Appendix A presents the CSO Maintenance and Inspection Plan update for review and approval, per Section S.13E.

If you have any questions or need additional information about this report, please contact Christopher W. Kuperstein, at 625-7903.

Sincerely,

Chuck Conklin
Director – Wastewater Treatment

Enclosure (1): 2016 CSO Annual Report (3 Copies)

cc: (W/O Enclosure):
Scott Simmons, Director of Public Works
Mike Taylor, Program Manager – RPWRF NLT
Dan Kegley, Director – Water & Wastewater Collection
Mike Coster, Plant Manager – RPWRF
Bill Peacock, Principal Engineer – Wastewater Management
Raylene Gennett, Operations Superintendent – Wastewater Management
Bruce Brurud, Instrumentation & Data Supervisor – Wastewater Management
Lars Hendron, Principal Engineer – RPWRF NLT
Janet Davey – Sewer Department Files
Michelle Dorgan – RPWRF Files



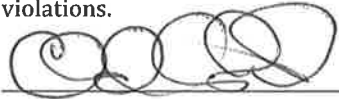
COMBINED SEWER OVERFLOW ANNUAL REPORT - 2016

Protecting the Spokane River



CERTIFICATION STATEMENT

I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Signature of Official

9-28-2017

Date

Chuck Conklin
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TABLE OF CONTENTS

Section 1: Introduction

1.1 City of Spokane Combined Sewer System	1-1
1.2 Spokane's Sewer System History	1-2
1.2.1 1972 Action Plan	1-3
1.2.2 1977 Sewer Overflow Abatement Plan	1-3
1.2.3 1979 Sewer Overflow Abatement Plan Update	1-4
1.2.4 1994 Combined Sewer Overflow Reduction Plan	1-4
1.2.5 2005 Combined Sewer Overflow Reduction Plan Amendment	1-4
1.2.6 2008 Sierra Club Settlement Agreement	1-4
1.2.7 2014 Combined Sewer Overflow Reduction Plan Amendment	1-5
1.3 City of Spokane's NPDES Permit	1-6
1.4 Organization of this Report	1-6

Section 2: Operation & Maintenance Activities

2.1 Nine Minimum Control Activities	2-1
2.1.1 Control 1: Proper Operation and Regular Maintenance Programs for the Sewer System and the CSOs	2-1
2.1.2 Control 2: Maximize Use of the Collection System for Storage	2-2
2.1.3 Control 3: Review and Modification of Pretreatment Requirements to Assure CSO Impacts are Minimized	2-3
2.1.4 Control 4: Maximization of Flow to the POTW for Treatment	2-3
2.1.5 Control 5: Prohibition of CSOs During Dry Weather	2-3
2.1.6 Control 6: Control Solids and Floatable Materials in CSOs	2-4
2.1.7 Control 7: Pollution Prevention	2-4
2.1.8 Control 8: Public Notification to Ensure that the Public Receives Adequate Notification of CSO Occurrences and CSO Impacts	2-4
2.1.9 Control 9: Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls	2-5

TABLE OF CONTENTS

2.2 Other Maintenance Activities _____	2-6
2.2.1 Sewer Cleaning Activities _____	2-6
2.2.2 Repair, Rehabilitation, and Replacement Activities _____	2-6
2.2.3 Sanitary Sewer Overflow Response and Prevention Activities _____	2-7
2.2.5 Inflow and Infiltration Activities _____	2-7
2.3 Annual Review of Operations and Maintenance Manual _____	2-7

Section 3: Capital Activities

3.1 CSO System Improvements _____	3-1
3.2 Planned CSO Projects for 2017 _____	3-2
3.3 CSO Project Schedule _____	3-5

Section 4: Monitoring Programs and Monitoring Results

4.1 Baseline Conditions _____	4-1
4.2 Precipitation Monitoring Program _____	4-3
4.3 Flow Monitoring Program and Results _____	4-4

Appendices

Appendix A: CSO O&M Manual _____	A-1
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Section 1: Introduction

The City of Spokane's 2016 Annual CSO Report is submitted to meet two sets of regulations: The National Pollutant Discharge Elimination System (NPDES) permit program, as authorized by the Clean Water Act (CWA) under Title 33 United States Code, Section 1251, and the Washington State Department of Ecology (WSDOE) Water Pollution Control Law under Chapter 90.48 Revised Code of Washington. WSDOE administers the NPDES Permit program under a delegation from the Environmental Protection Agency (EPA).

This annual report is also submitted to share information with the public on activities that improve the City of Spokane's wastewater collection system and operations with the goal of minimizing pollution of the Spokane River. The report is organized in the following order:

- Section 1: Introduction
- Section 2: Operation and Maintenance Activities
- Section 3: Capital Activities
- Section 4: Monitoring Program and Monitoring Results
- Appendix A: Operations and Maintenance Plan for CSO Regulators and Outfalls

Additional information about the Combined Sewer Overflow Program and Integrated Plan may be found at: <https://my.spokanecity.org/publicworks/wastewater/cso/> and <https://my.spokanecity.org/publicworks/wastewater/integrated-plan/>

1.1 CITY OF SPOKANE COMBINED SEWER SYSTEM

The City of Spokane's wastewater collection system includes sanitary sewers and combined sewers, as shown in Figure 1-1. In areas of the City served by combined sewers, runoff from the street enters the system through catch basins and is combined with sewage and is conveyed to the Riverside Park Water Reclamation Facility (RPWRF). In the downtown area, rainwater from some roof drains also enters the combined system. At the end of 2016, there were approximately 480 miles of sanitary sewers and 388 miles of combined sewers.

In areas of the City that are fully or partially separated, runoff from City streets enters either separated storm sewers that convey stormwater to the Spokane River or Latah (Hangman) Creek, or directly to ground through drywells or bioinfiltration swales. Stormwater which is collected and discharged in a manner *other* than evaporation or a combined sewer system, is regulated under a separate set of regulations, including the 2014-2019 Eastern Washington Phase II Municipal Stormwater Permit and the Underground Injection Control (UIC) regulations. At the end of 2016, the City has 218 miles of separated storm sewers and 4,149 UIC drywells.

During storm events, the volume of runoff flowing into the collection system can exceed the capacity of the combined sewer system and treatment plant. When this occurs, the collection system overflows at outfalls to the Spokane River or Latah (Hangman) Creek. As of the end of 2016, there are 24 combined sewer overflow regulators that overflow to 20 combined sewer overflow outfalls.

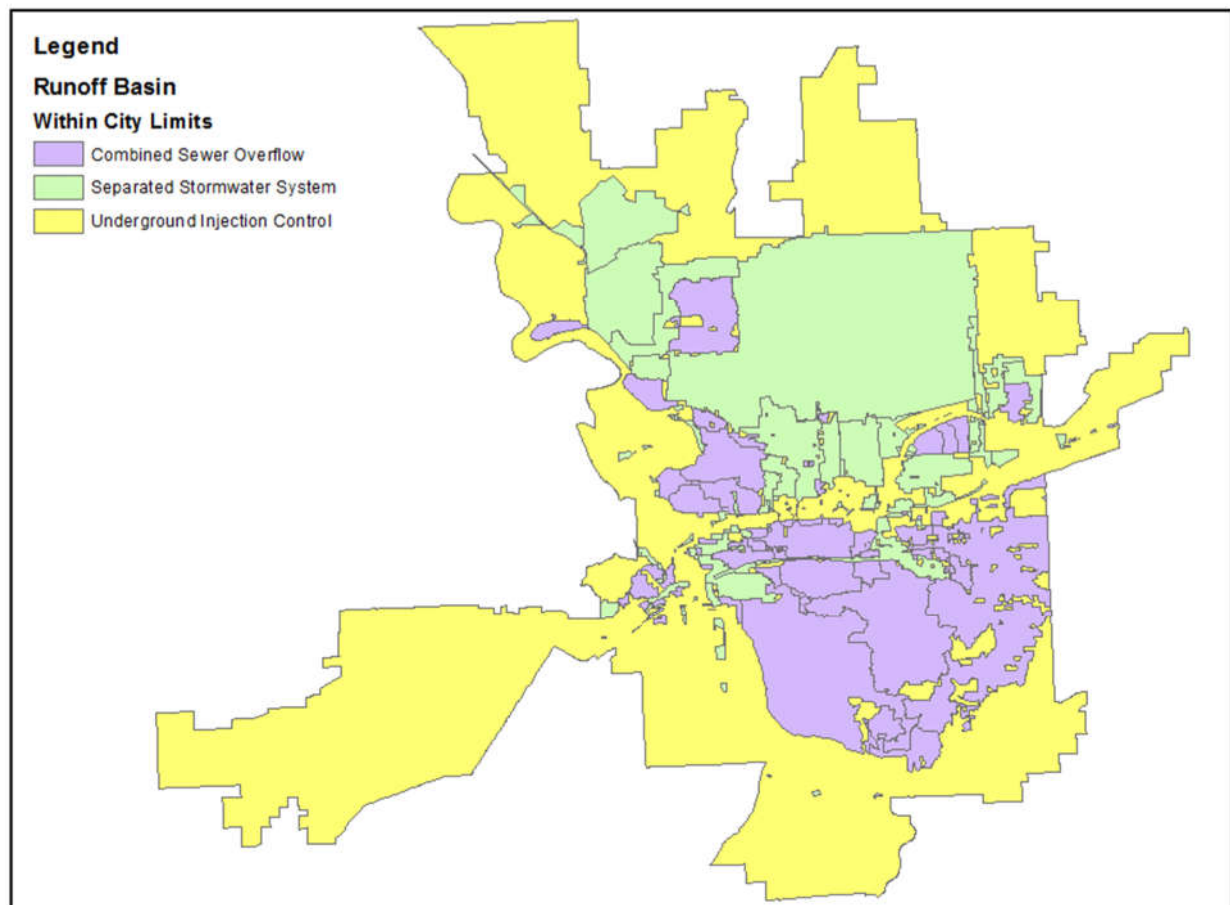


FIGURE 1-1 MAP OF CSO / STORM / UIC AREAS

1.2 SPOKANE'S SEWER SYSTEM HISTORY

The first sewer line in Spokane was built under Howard Street from First Avenue to the Spokane River in June 1888. In the 1890s, the area from the base of the South Hill to the river between Cedar and Division Streets was sewered. Growth of the system paralleled the City's growth through the years as several hundred miles of sewer lines of various sizes and materials were added, all emptying into the Spokane River or Latah (Hangman) Creek.

In 1946, a bond issue was passed to construct intercepting lines to convey sewage to a planned sewage treatment plant. The interceptor system was installed between 1948 and 1958. The system was initially designed to carry 2.3 times the average dry weather flow based on a future population of 258,000 people. This main interceptor capacity was approximately 110 million gallons per day (mgd) and the Hollywood interceptor for the northwest section of the City was 15mgd for a total conveyance of 125mgd.

In May 1958, the first phase of a new sewage treatment plant was placed into operation. It was expanded in 1961-1962. The capacity of the sewage treatment plant was 50mgd. During wet weather, flows in excess of 50mgd would flow directly to the Spokane River via 44 CSO outfalls in the system, and also through a bypass diversion at the plant.

The City of Spokane has been diligently working on a series of projects since 1972 to reduce overflows to the Spokane River. The results and planned goals for reducing the frequency, volume, and number of overflow structures are summarized in Figure 1-2.

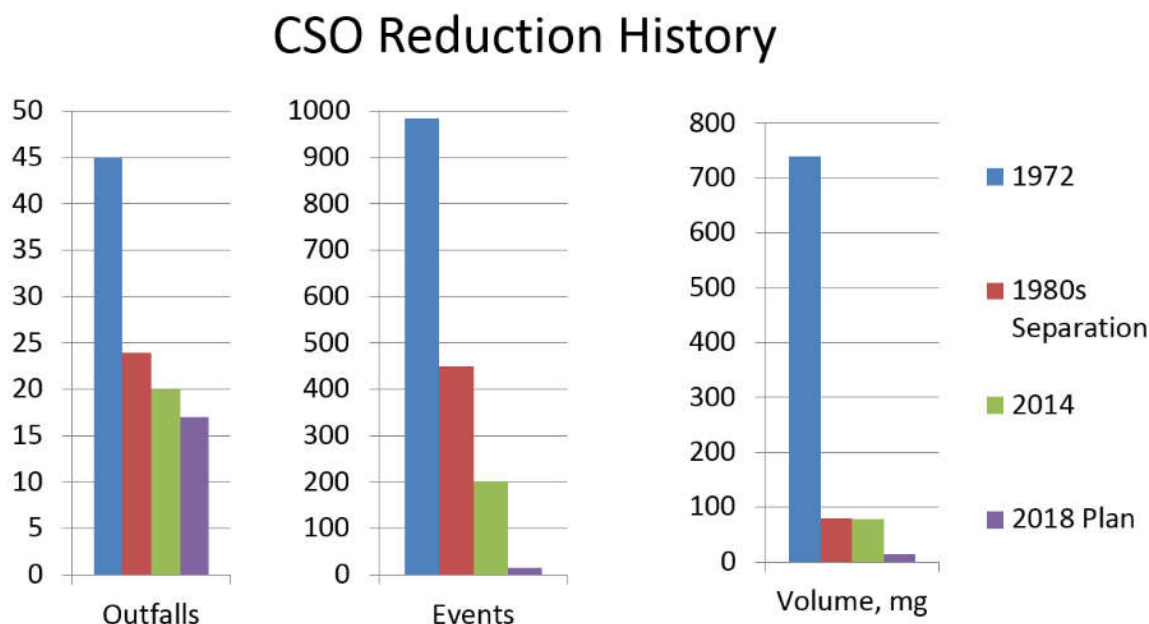


FIGURE 1-2 CSO REDUCTION HISTORY PROGRESS

1.2.1 – 1972 Action Plan

The 1972 Action Plan was published in May 1972, five months *before* the Clean Water Act was passed by Congress on October 18, 1972. This plan laid out the environmental need to upgrade the sewage treatment plant capacity and include secondary biological treatment as part of the process. It also laid out a plan for screening and disinfection of wet weather overflows in five regional treatment areas, combined with the construction of separated storm sewer systems in some areas. During an average year, it was estimated that just under 1,000 overflow events occurred from 44 overflow points totaling 447 million gallons of combined sewage, along with approximately 280 million gallons bypassed at the sewage treatment plant.

1.2.2 – 1977 Sewer Overflow Abatement Plan

The 1977 Sewer Overflow Abatement Plan further laid out several alternatives for reducing Combined Sewer Overflows to the Spokane River. Growth in the southeast corner of the City combined with river inflow during periods of high river levels were contributing to dry weather overflows from three discharge points. This report selected an alternate for separation of the north side of the City. This alternate also allowed for the City's future sanitary sewer service to Spokane Valley. During an average year, it was estimated that over 929 overflow events occurred from 33 overflow points totaling 565 million gallons of combined sewage, and an estimated 560 million gallons of bypasses at the sewage treatment plant.

1.2.3 – 1979 Sewer Overflow Abatement Plan Update

The 1979 Sewer Overflow Abatement Plan update amends the 1977 plan to further clarify areas to separate with storm sewers and explore which areas outside the City can be added to the sewer system. The advanced wastewater treatment plant was constructed and was achieving greater than the 85 percent phosphorus removal as required by the NPDES permit. A computational analysis for calculations of flow in tandem with flow monitoring at key points along the interceptor system further refined the allocation of flow capacity for each CSO basin. Suggested overflow settings were detailed for each basin after the proposed separation of the north side of the City to storm sewers.

1.2.4 – 1994 Combined Sewer Overflow Reduction Plan

The 1994 Combined Sewer Overflow Reduction Plan put in place a program for reducing Combined Sewer Overflows to the Spokane River with a 20-year schedule. As a result of the storm sewer separation of 64 percent of the City's sewer service area, the CSO volume to the Spokane River had been reduced by 491 million gallons per year, or 86 percent, for a cost of roughly \$50 million.

The 1994 plan called for an integrated approach to CSO pollutant reduction to achieve Ecology's requirement of just one overflow event per outfall per year. This included the following: street surface cleaning, catch basin cleaning, infiltration and inflow control, water use reduction, storage facilities, optimization of existing control structures, and additional storm separation. A computational Storm Water Management Model (SWMM) was created and calibrated to existing dry and wet weather conditions. An iterative phased approach of constructing a few different facilities, monitoring the results, and constructing the next phase from those results was proposed. During an average year, it was estimated that over 467 overflow events occurred from 24 overflow points totaling 79 million gallons of combined sewage.

1.2.5 – 2005 Combined Sewer Overflow Reduction Plan Amendment

The 2005 Combined Sewer Overflow Reduction Plan Amendment recalibrated the SWMM model using historical rain data, improved modeling capability and increased flows from recent growth in parts of the City. The plan also began looking system-wide for adjustments in interceptor controls and storage volume, as well as creating six CSO reduction alternatives and their probable costs. The plan called for a 5-year moving average for frequency compliance, a 2-year design storm, with snowmelt, and a beta factor to accommodate differences in rainfall correlated to spatial distances from rain gauges. Several facilities from the 2005 plan were constructed and monitored for performance before constructing more facilities.

1.2.6 – 2008 Sierra Club Settlement Agreement

The City of Spokane and the Sierra Club entered into a settlement agreement in 2008 regarding dry weather overflows. The elements of the Agreement have been completed. Pursuant to the Agreement, eleven CSO regulators prone to dry weather overflows were modified or Control Facilities installed. The final regulator was addressed by a project completed in late 2011. Also, improving CSO-related training and maintenance procedures and enhancing public information and notification were undertaken. Information has been added to the City's website and major river access points for the public and warning flags are deployed at major river access points if a dry weather overflow occurs. The CSO O&M Plan is updated annually, and additional precautions during maintenance have been established, and training is ongoing.

1.2.7 – 2014 Combined Sewer Overflow Reduction Plan Amendment

In March 2014, The City filed a CSO Reduction Plan Amendment maintaining the December 31, 2017 compliance schedule as mandated by the NPDES permit. The CSO Reduction Plan Amendment reflects a change in circumstances which include more accurate long term meteorological records and data to effectively size the CSO control facilities; the valuable experience the City has gained with its completed weir modifications and CSO control facilities; the 20-year moving average for annual CSO reporting; and EPA and Ecology's recommendations to incorporate an integrated approach to managing municipal stormwater, municipal wastewater, and CSOs. Baseline conditions were updated and are reflected in Table 4-2 of this report.

The City analyzed all CSO basins and incomplete separation areas and classified each according to a risk profile that included options for more storage, possibility of growth, and other factors. The risk profile was then used in conjunction with basin-level continuous simulation modeling to select a facility size based on a selected number of overflows per year from each basin. This was validated by a system-wide continuous simulation model and from flow monitoring data. Where the model and the flow monitoring disagreed, further analysis was used to select a facility size.

Another input to the facility sizing was a re-optimization of the flow control to the interceptor from each CSO basin. The re-optimization had several goals. The first goal was to limit peak flows in the A.L. White Interceptor to 120mgd versus its theoretical full-pipe capacity of about 130mgd. The second goal was to convey more flow from basins where it is infeasible or more expensive to construct a CSO facility and to convey less flow and construct more storage for basins that had more feasibility and were less expensive to construct. The City's approach for sizing CSO facilities changed from volume generated by a 2-year, 24-hour SCS Type II storm event with snowmelt to a 1.2-year, 24-hour SCS Type II storm event. The other change in sizing CSO facilities was to change the five-year rolling average standard to a 20-year rolling average standard as stated in the current NPDES permit. The result was that the control volumes for CSO storage were reduced from a total of 28.6mg of storage in the system in the 2005 CSO Plan Amendment to between 11.3mg and 13.0mg of storage in the system in the 2014 CSO Plan Amendment.

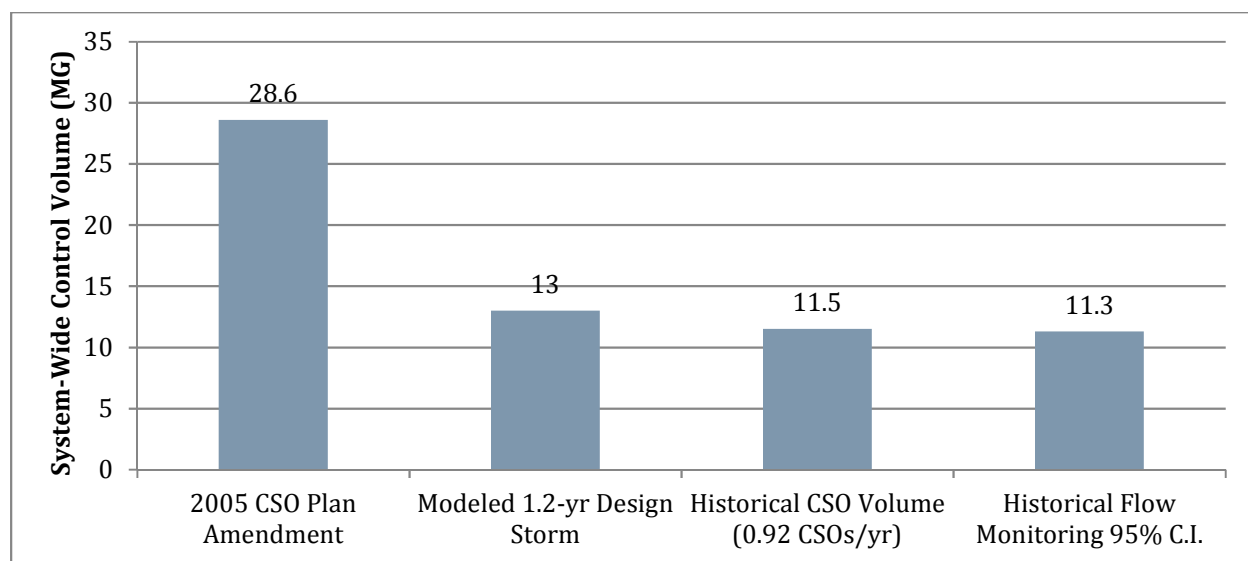


FIGURE 1-3: COMPARISON OF CSO FACILITY SIZING IN 2005 VS. THREE METHODS USED IN THE 2014 CSO PLAN AMENDMENT.

1.3 CITY OF SPOKANE NPDES PERMIT

The City of Spokane's Combined Sewer System (CSS) is operated under two sets of regulations: The National Pollutant Discharge Elimination System (NPDES) permit program, as authorized by the Clean Water Act (CWA) under Title 33 United States Code, Section 1251, and the Washington State Department of Ecology (WSDOE) Water Pollution Control Law under Chapter 90.48 Revised Code of Washington. WSDOE administers the NPDES Permit program under a delegation from the Environmental Protection Agency (EPA). Because of the two sets of regulations, there are various reporting requirements that must be fulfilled by both laws. As a result, this report is organized to fulfill both reporting requirements with respect to the CSS and CSOs. The current NPDES permit WA-002447-3 was due to expire on June 30, 2016, but has been administratively extended pending issuance of a new permit. The current permit can be found on the City's website:

<https://static.spokanecity.org/documents/publicworks/wastewater/treatmentplant/reclamation-facility-permit.pdf>

1.4 ORGANIZATION OF THIS REPORT

TABLE 1-1: 2016 CSO ANNUAL REPORTING REQUIREMENTS		
Source	Requirement	Report Location
NPDES S13.A	Locations of Combined Sewer Outfalls.	Table 4-1
NPDES S13.B	Demonstrate compliance with performance standards of WAC 173-245 on a 20-year moving average period.	Table 4-9
NPDES S13.C	Implement and document nine minimum controls for CSOs.	Section 2.1
NPDES S13.D	Submit a progress report of the progress made implementing the CSO Reduction Plan.	Section 3.3
NPDES S13.E	Submit annually a plan for maintaining the operation, monitoring and function of CSOs.	Appendix A
NPDES S13.G.3	Continue the CSO discharge monitoring plan.	Section 4.2, Section 4.3
NPDES S13.G.4	Continue use and maintenance of public notification system of CSO impacts during wet and dry weather conditions.	Section 2.1.8
NPDES S13.H	Maintain records of all CSO-related bypasses at the treatment plant.	Table 4-8, Table 4-10
WAC 173-245-090(1)(a)	Detail the past year's frequency and volume of combined sewage discharged.	Table 4-8, Table 4-10
WAC 173-245-090(1)(b)	Explain the previous years' CSO reduction accomplishments.	Section 3.1
WAC 173-245-090(1)(c)	List the projects planned for the next year.	Section 3.2

Section 2: Operations and Maintenance Activities

This section describes the Operation and Maintenance (O&M) activities the Spokane Wastewater Department undertakes to reduce the number of volume of Sanitary Sewer Overflows (SSOs), Dry Weather Overflows (DWOs) and Combined Sewer Overflows (CSOs).

2.1 NINE MINIMUM CONTROL ACTIVITIES

Section S13.C of the City's NPDES Permit Requires compliance with US EPA CSO control policy (59 FR 18688) that states: "permittees with CSOs should submit appropriate documentation demonstrating implementation of the nine minimum controls..." The NPDES Permit requires annual reporting on the City's ongoing efforts to comply with these controls. The following describes the work performed in 2016 on each of these nine minimum controls.

2.1.1 Control 1: Proper Operation and Regular Maintenance Programs for the Sewer System and the CSOs

"Implement proper operation and maintenance programs for the sewer system and all CSO outfalls to reduce the magnitude, frequency, and duration of CSOs. The program must consider regular sewer inspections; sewer, catch basin, and regulator cleaning; equipment and sewer collection system repair or replacement, where necessary; and disconnection of illegal connections."

Every year the City's Wastewater Management (WWM) Department performs O&M activities to reduce the frequency and volume of preventable overflows. In 2016, the following activities were performed to ensure proper operation of the collection system:

TABLE 2-1: SUMMARY OF 2016 O&M ACTIVITIES	
Activity	Quantity
Miles of sewer and storm lines cleaned.	842 miles cleaned
Miles of sewer and storm lines cctv inspected.	182 miles inspected
Number of catch basins inspected.	12,328 inspections
Number of catch basins cleaned.	2,315 cleanings
Number of catch basins modified to add floatable controls.	1,550 modified
CSO weir and facility inspections.	1,004 inspections
CSO weir and facility cleanings.	16 cleanings
Number of lift station inspections.	458 inspections
Number of lift station cleanings.	283 cleanings

The City's WWM Department routinely inspects sewer and storm lines using Closed Circuit Television (CCTV) equipment. To assist in identifying trouble areas in the collection system, the department uses the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) defect coding system.

The WWM Department has an aggressive inspection program for the collection system. Inspections often identify trouble spots in the collection system before it becomes a backup. When a sewer is inspected and identified as having a maintenance-related problem, the sewer is placed on a routine cleaning schedule to prevent future maintenance-related backups. The routine maintenance frequencies vary from as short as monthly to as long as annually. Routine maintenance activities include:

- Hydro for flushing light to medium debris.
- Hydro-sawing for root control and grease.
- Rodding or balling for clearing active blockages.
- Chemical root treatment to mitigate growth of roots.

The WWM Department performs routine electrical and mechanical system preventative maintenance on all lift stations to ensure proper operation of the parts of the collection system that require pumping uphill to gravity mains. Most of these lift stations have backup generators to prevent CSO and SSO events during the event of a power failure. By the end of 2015, the City completed the installation of backup generators on all but two lift stations. The remaining lift stations have adequate storage capacity for a response by WWM crews with a portable generator. Only two lift stations convey combined sewage: Elm Street and Clarke Avenue.

In 2006, the City's WWM Department developed and implemented its first municipal CSO Operations and Maintenance Plan (O&M Plan), with annual revisions beginning in 2010. The goal of the O&M Plan is to protect water quality and reduce the discharge of pollutants via CSOs into receiving waters. The O&M Plan includes names and contact information of designated responsible staff with specific procedures clearly detailed; a list of the critical elements in the CSS: facilities (control tanks, CSO regulator structures, weirs, and so forth) included under this Plan; frequency of routine inspections; wet and dry weather procedures; emergency notification procedures; and record keeping procedures. Repairs and necessary modifications are made to broken or malfunctioning CSS components. A copy of the City's O&M Plan is submitted under Appendix A.

In November 2016, a legacy connection to the basin 34 CSO outfall pipe was discovered. The side sewer was quickly disconnected and relayed to an active sewer main in N Napa street, upstream of the I-07 facility that is planned for construction in 2017.

2.1.2 Control 2: Maximize Use of the Collection System for Storage

"Implement procedures that will maximize use of the collection system for wastewater storage that can be accommodated by the storage capacity of the collection system in order to reduce the magnitude, frequency, and duration of CSOs."

Current CSO regulator settings correspond to full-pipe conditions in the main influent interceptor (I02) entering the Riverside Park Water Reclamation Facility (RPWRF). As part of the O&M Plan, WWM has a regular preventive inspection program to ensure that trapped sedimentation or debris is cleaned out of catch basins and CSS pipes that could otherwise restrict proper flow. Visual and remote inspections by a Wastewater Specialist or a CSO Instrument Technician are completed for each uncontrolled CSO regulator structure every week. In some cases, up-sized in-line storage is used to help reduce overflows. The City's program includes infiltration & inflow (I/I) reduction projects such as grouting, short-line and full-length cured-in-place pipe (CIPP) lining. In 2016, the City installed three CIPP short-liners.

2.1.3 Control 3: Review and Modification of Pretreatment Requirements to Assure CSO Impacts are Minimized

“Review and modify, as appropriate, its existing pretreatment program to minimize CSO impacts from the discharges from nondomestic users.”

The City routinely surveys existing and new businesses connected to its collection system. As a result, non-domestic customers with the potential to adversely impact the treatment system are identified and managed. At the end of 2016, there were three listed Categorical Industrial Users, four listed Significant Industrial Users, and eight listed Non-Significant Categorical Industrial Users.

Part of the Pretreatment Program is the Fats, Oils, and Grease (FOG) Program, which implements the City’s Municipal Code requirement to remove FOG from wastewater through the use of grease traps or other methods. FOG has a detrimental effect on the City’s sewers and is a significant cause of obstructions. Each time a sewer line is observed by CCTV to be partially or fully obstructed with grease, an investigation is conducted upstream to identify potential sources and enforce municipal code.

2.1.4 Control 4: Maximization of Flow to the POTW for Treatment

“Operate the POTW treatment plant at maximum treatable flow during all wet weather flow conditions to reduce the magnitude, frequency, and duration of CSOs. The Permittee must deliver all flows to the treatment plant within the constraints of the treatment capacity of the POTW.”

RPWRF has sufficient capacity to provide full treatment for wet weather flow during all but the most extreme storm events. Up to 100 million gallons per day (mgd) is fully treated on a real-time basis within the duration of most storms. When flows exceed 100mgd, up to 4 million gallons (mg) of excess flow volume can be diverted to on-site storage and receives full treatment after the storm. On very rare occasions when more than 4mg is diverted, the excess volume above 4mg receives primary treatment and disinfection prior to discharge. As part of the CSO Reduction Plan Amendment submitted in early 2014, the main I02 interceptor flows will be limited to 120mgd through the use of upstream CSO storage. In addition, the treatment plant is being upgraded with a fifth primary clarifier to provide full primary and secondary treatment for up to 125mgd of wet weather flows. This will help ensure that nearly all flows to RPWRF will receive full primary and secondary treatment.

2.1.5 Control 5: Prohibition of CSOs During Dry Weather

“Dry weather overflows from CSO outfalls are prohibited. The Permittee must report each dry weather overflow to the permitting authority as soon as it becomes aware of the overflow. When it detects a dry weather overflow, the Permittee must begin corrective action immediately and inspect the dry weather overflow each subsequent day until it has eliminated the flow.”

The City’s CSO dry weather program, as outlined in the O&M plan, is both proactive and reactive. The plan includes visual and remote inspections with specific procedures outlined; early warning and overflow alarm monitoring and coordinated response protocols; combined sewer system (CSS) mapping; crew training to avoid overflows from CSS maintenance; and a public notification hotline (344-FISH) which is displayed on a variety of public education materials and on the CSO notification/information signs on the shore at each CSO outfall. The WWM Department conducts regular cross-training of other City departments such as Water & Hydroelectric Services, Streets, Parks and the Fire Department to prevent dry weather overflows from hydrant flushing, water line flushing, fire-fighting activities, and the draining of Park department pools. In 2016, there were no dry weather overflows.

2.1.6 Control 6: Control Solids and Floatable Materials in CSOs

"Implement measures to control solid and floatable material in CSOs."

The control of solid and floatable materials is an inherent part of the City's O&M plan. Many existing and all new catch basins in CSS areas have 90 degree down-turned elbows that retain floatables within the catch basins. Heavier solid materials settle to the bottom of the catch basins. This serves as a pretreatment system and captured trash and sediment are pumped out, decanted, and landfilled on a routine basis by maintenance crews. In 2016, 1,550 catch basins were modified to accept elbows.

As each CSO control structure is modified to add storage in compliance with the CSO Long Term Control Plan, floatable controls are included in the CSO storage facilities and overflow points to largely eliminate any floatable material discharge.

2.1.7 Control 7: Pollution Prevention

"Implement a pollution prevention program focused on reducing the impact of CSOs on receiving waters."

The City conducts a regular street sweeping schedule that aids in keeping trash and debris out of the CSS. In addition, catch basins are pumped regularly as a preventive maintenance measure. Leaves are swept and removed from City streets in the fall. Since 2010, the City has been placing markers near curb drain inlets and basins to inform and remind the public about where wastewater goes. The curb markers installed in CSS areas read: "Dump No Waste – Drains to River" and include a hotline phone number to report dumping. In 2016, 1,252 curb markers were installed by WWM crews.



The MS4 program includes an illicit discharge complaint program. Any illicit discharge complaints are investigated by one the WWM sewer inspectors. The WWM inspectors also ensure construction projects follow BMPs and manage stormwater on site to ensure dirt and other debris does not enter the storm or sewer collection systems. In 2016 there were 24 investigations into illicit discharge complaints and 78 inspected commercial construction sites.

2.1.8 Control 8: Public Notification to Ensure that the Public Receives Adequate Notification of CSO Occurrences and CSO Impacts

"Implement a public notification process to inform the citizens of when and where CSOs occur. The process must include (a) mechanism to alert persons of the occurrence of CSOs and (b) a system to determine the nature and duration of conditions that are potentially harmful for users of receiving waters due to CSOs."

Real-time CSO status updates can be viewed by the public on the department's website, <https://my.spokanecity.org/publicworks/wastewater/cso/>. The website includes the CSO number, location with map, and the date/time of any overflow event within the past 48 hours. It also informs the public and

recreational visitors that Spokane River water activities should be avoided in these areas during and after heavy rainfall or snowmelt. In 2016, there were approximately 2,600 views of this page on the department's website.

Information kiosks regarding CSOs are located at three popular river access points. If a dry weather overflow occurs, warning signs with orange flags are opened at these three locations to warn the public. When there is a dry weather overflow event, the City also notifies the Spokane Regional Health District and the Washington State Department of Ecology in accordance with the O&M Plan.

2.1.9 Control 9: Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls

"Monitor CSO outfalls to characterize CSO impacts and the efficacy of CSO controls. This must include the collection of data that it will use to document the existing baseline conditions, evaluate the efficacy of the technology-based controls, and determine the baseline conditions upon which it will base the long-term control plan. This data must include:

- a) *Characteristics of the combined sewer system including the population served by the combined portion of the system and locations of all CSO outfalls in the CSS.*
- b) *Total number of CSO events and the frequency and duration of CSOs for a representative number of events.*
- c) *Locations and designated uses of receiving water bodies.*
- d) *Water quality data for receiving water bodies.*
- e) *Water quality impacts directly related to CSO (for example, beach closing, floatables, wash-up episodes, fish kills)."*

The City's CSS serves approximately 100,000 citizens. The Spokane River and Latah Creek are the only two water bodies that receive CSO discharges, with 18 outfalls and two outfalls, respectively. All outfalls are mapped in GIS, marked with signs, and each regulator leading to an outfall is equipped with flow monitoring and telemetry. The City operates the flow monitoring/telemetry for timely alarms, public notification, compliance data, and operation and performance of CSO facilities. In 2016, the City achieved a 99.991% uptime with its CSO monitoring system. The CSO flow monitoring team continues to work hard to mitigate impacts of the ongoing CSO construction projects to maintain the integrity and quality of the telemetry data during construction.

Through the mid-2000s, the City sampled the receiving water bodies during and after large wet weather overflows to determine how quickly fecal coliform levels returned to background. The CSO river sampling program is now focused on dry weather events. Following any dry weather overflow during the high river use season, the City conducts river sampling to determine when fecal coliform levels downstream of the affected outfall have returned to background. The Spokane Regional Health District is informed by the City of any dry weather overflows and is responsible for any public health alerts.

2.2 OTHER MAINTENANCE ACTIVITIES

2.2.1 Sewer Cleaning Activities

The City of Spokane undertakes an extensive cleaning maintenance program. These activities include flushing, balling, rodding, hydroing and other activities. When CCTV video or customer complaints indicate that there is a problem or a potential future problem with a sewer line, it is placed on a scheduled maintenance list in the maintenance management system to ensure timely cleaning occurs. If the problem becomes worse, the scheduled maintenance time is shortened, and the line is flagged for replacement or lining.

TABLE 2-2: SUMMARY OF 2016 SCHEDULED SEWER CLEANING

Schedule	Number of Lines
Bi-monthly	12
Monthly	106
Every 2 Months	13
Every 3 Months	107
Every 4 Months	14
Every 6 Months	305
Every 9 Months	1
Annually	10
Total	568

2.2.2 Repair, Rehabilitation, and Replacement Activities

The City maintains two construction crews that replace, rehabilitate and repair sewer and stormwater lines. These crews respond to emergency situations, but also replace or repair lines and catch basins identified by citizens, crews, and CCTV reports. The City also contracts out large line cured-in-place pipe (CIPP) rehabilitation most years for identified lines that have excess infiltration or are found to be structurally deficient.

TABLE 2-3: SUMMARY OF 2016 SEWER REPAIR AND REPLACEMENTS

Activity	Number
Repair Storm / Sanitary Line	40
Replace Storm / Sanitary Line	38
New Storm / Sanitary Line	4
Catch Basin Repairs	11
Catch Basin Replacement	14
New Drywell	1
Drywell Rehabilitation / Repair	18
Drywell Replacement	2
New Manhole	3
Manhole Repairs / Modifications	9
Swale Repairs / Modifications	7
Total # Assets	147

2.2.3 Sanitary Sewer Overflow Response and Prevention Activities

A small number of Sanitary Sewer Overflows (SSOs) do occur every year and are promptly reported to Ecology, along with the proposed remediation for solving the overflow in the future. Due to the average age of pipes in the City's collection system, the City has an aggressive CCTV inspection program to prevent SSOs through routine and unscheduled maintenance activities. The two most common causes of SSOs are weather-related surcharges of side sewers and tree roots plugging a City sewer main. Other activities can cause SSOs as well. The most common is City large line water main breaks that can overwhelm parts of the collection system. Other causes are construction activities and vandalism. In 2016, there was a total of 1 SSO as a result of tree roots.

TABLE 2-4: SUMMARY OF SANITARY SEWER OVERFLOWS BY CAUSE, 2011 - 2016

Cause	2011	2012	2013	2014	2015	2016
Weather-Related	20	24		9		
Tree Roots	3	2	2	3	4	1
Water Main Break	5				4	
Crushed Line	11					
Construction Activity				1	1	
Vandalism					1	
Grease		1				
Other			1		1	
Total # SSOs	39	27	3	13	11	1

2.2.4 Inflow and Infiltration Activities

The City has worked tirelessly in removing Inflow and Infiltration (I/I) from the sewer collection system. Several methods are used to reduce I/I in the system including CIPP lining, stormwater separation or redirection, plugging of abandoned sewer lines, and other methods.

One of the main causes of I/I within the collection system is high river flows that increase the groundwater level around some of the older pipes along the river. The City has lined large sections of the main interceptor downtown and largely eliminated approximately 10mgd of I/I. Another successful I/I elimination project was the lining of many pipes and upgrading the Springfield lift station in the area south and east of Gonzaga University. As a commitment to the optimizing the capacity of the upcoming tertiary membrane treatment installation at the treatment plant, another 10mgd needs to be removed during extended times of high river. Two lines in the Trent / Erie area and north of Trent along the river have been identified as contributing 4-8mgd of flow during flood stage in 2011 and are on the CIPP projects list.

2.3 ANNUAL REVIEW OF OPERATIONS & MAINTENANCE MANUAL

The CSO Operations and Maintenance Manual (O&M) was reviewed and revised on September 25, 2017. The O&M plan is attached with Appendix A of this report. As new CSO facilities come online, facility inspection checklists are created. CSO crews are also trained in CSO inspections on an annual basis. Training includes a review of normal and abnormal conditions within facilities, and what preventative maintenance is required in each area of a CSO facility, along with checking safety and gas detection system. Procedures and checklists for Dry Weather Overflows (DWOs) are reviewed. Design standards for CSO Facilities are reviewed based on maintenance feedback to minimize maintenance frequency and effort.

Section 3: Capital Activities

3.1 – 2016 CSO SYSTEM IMPROVEMENTS

Below is a list of CSO projects completed in the 2016 year. 2016 through 2018 are busy years as the majority of the remaining CSO control projects are planned to be in construction during this period of time.

TABLE 3-1: CSO CONTROL PROJECTS COMPLETED IN 2016

City Project #: 2013042

CSO Basin #: 20 & 24

Location: 43 Ave. & S Hatch Rd.

Description: Construction of a 205,000 gallon CSO Control facility #20 and other associated construction with CSO Basin 24. Elimination of CSO 20 outfall to Latah Creek (pending a future project).

Estimated Cost: \$6.4m

Estimated Completion: 2016 – Q1*
Elimination of CSO 20 outfall will be coupled with future downstream pipe capacity project.



3.2 PLANNED CSO PROJECTS FOR 2017

Below is a list of CSO projects scheduled for construction in the 2017 year.

TABLE 3-2: CSO CONTROL PROJECTS SCHEDULED FOR CONSTRUCTION IN 2017



<p>City Project #: 2013211 & 2015099</p> <p>CSO Basin #: 12</p> <p>Location: N Pettet Dr.</p> <p>Description: Construction of 694,000 gallon CSO Control facility #12 and relocating outfall down Pettet Dr. to CSO 10 / Cochran Storm outfall.</p> <p>Estimated Cost: \$8.7m</p> <p>Estimated Completion: 2017 – Q1</p>	
<p>City Project #: 2013212</p> <p>CSO Basin #: 14/15</p> <p>Location: West Central Neighborhood</p> <p>Description: Construction of bioretention facilities to treat and infiltrate runoff, disconnecting streets from the combined sewer system.</p> <p>Estimated Cost: \$2.0m</p> <p>Estimated Completion: 2018 – Q3</p>	
<p>City Project #: 2010076</p> <p>CSO Basin #: 23</p> <p>Location: Ash Street & Bridge Ave., Cedar Street & Summit Parkway</p> <p>Description: Construction of a 38,000 gallon CSO Control facility and a 13,000 CSO Control facility.</p> <p>Estimated Cost: \$1.5m</p> <p>Estimated Completion: 2018 – Q2</p>	

TABLE 3-2: CSO CONTROL PROJECTS SCHEDULED FOR CONSTRUCTION IN 2017

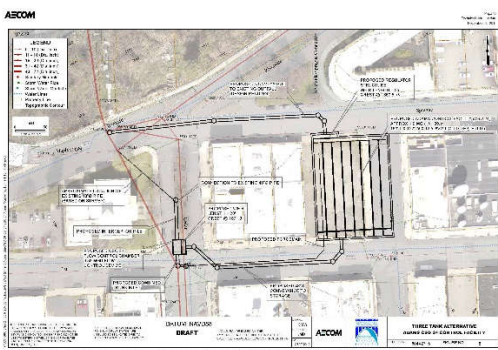

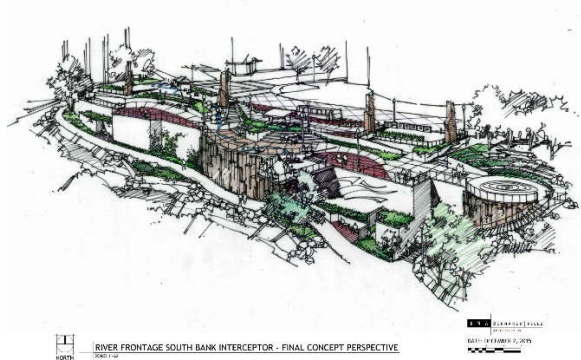

<p>City Project #: 2010087</p> <p>CSO Basin #: 24</p> <p>Location: 1st Ave. & Adams Street</p> <p>Description: Construction of a 1,900,000 gallon CSO Control facility.</p> <p>Estimated Cost: \$16.3m</p> <p>Estimated Completion: 2018 – Q3</p>	
<p>City Project #: 2015178</p> <p>CSO Basin #: 25</p> <p>Location: Peaceful Valley</p> <p>Description: Construction of a 43,000 gallon CSO Control facility and associated partial disconnection and stormwater swales.</p> <p>Estimated Cost: \$1.0m</p> <p>Estimated Completion: 2018 – Q3</p>	
<p>City Project #: 2010088</p> <p>CSO Basin #: 26</p> <p>Location: Spokane Falls Blvd. from Monroe Street to Lincoln Street</p> <p>Description: Construction of a 2,200,000 gallon CSO Control facility and associated plaza above tank.</p> <p>Estimated Cost: \$33.2m</p> <p>Estimated Completion: 2018 – Q4</p>	
<p>City Project #: 2013213</p> <p>CSO Basin #: 33-1</p> <p>Location: Liberty Park</p> <p>Description: Construction of 2,040,000 gallon CSO Control facility.</p> <p>Estimated Cost: \$12.0m</p> <p>Estimated Completion: 2017 – Q3</p>	

TABLE 3-2: CSO CONTROL PROJECTS SCHEDULED FOR CONSTRUCTION IN 2017

<p>City Project #: 2012088</p> <p>CSO Basin #: 34-1 and I07</p> <p>Location: Riverside Avenue near Lee Street and Napa Street</p> <p>Description: Construction of a 1,400,000 gallon CSO Control facility and a 200,000 Interceptor Protection facility.</p> <p>Estimated Cost: \$15.5m</p> <p>Estimated Completion: 2018 – Q3</p>	
<p>City Project #: 2010102</p> <p>CSO Basin #: 41</p> <p>Location: Upriver Drive and Rebecca Street</p> <p>Description: Construction of a 380,000 gallon CSO Control facility.</p> <p>Estimated Cost: \$0.85m</p> <p>Estimated Completion: 2017 – Q4</p>	
<p>City Project #: 2013214</p> <p>CSO Basin #: I-03</p> <p>Location: T.J. Meenach and Northwest Blvd.</p> <p>Description: Construction of 1,240,000 gallon interceptor protection control facility #I-03.</p> <p>Estimated Cost: \$9.85m</p> <p>Estimated Completion: 2017 – Q4</p>	
<p>City Project #: 2013215</p> <p>CSO Basin #: I-04</p> <p>Location: Monroe St. & Bridge Ave.</p> <p>Description: Construction of 977,000 gallon interceptor protection control facility #I-04.</p> <p>Estimated Cost: \$11.2m</p> <p>Estimated Completion: 2017 – Q2</p>	

3.3 CSO PROJECT SCHEDULE

Below is an adjusted CSO project schedule. The schedule was first published in the 2014 CSO plan amendment and reflects the revised project schedule as it stands at the end of 2016.

TABLE 3-3: CSO CONTROL PROJECT SCHEDULE

		2016				2017				2018								
	Tank Name	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4					
CSO Projects																		
6	Shadle Bluff - Complete																	
7	Downriver – Complete																	
12	Doomsday Hill	D	C	C	C	C	C											
14	Summit				D	D	D	C	C	C	C							
15	Summit				D	D	D	C	C	C	C							
20	Hatch – Complete	C																
23	Maple Regulators			P	D	D	D	C	C	C	C							
24	Jefferson	D	D	D	D	D	C	C	C	C	C	C	C					
25	Main Ave	P	P	P	P	D	D	D	C	C	C	C	C					
26	Spokane Falls	D	D	D	D	D	C	C	C	C	C	C	C					
33-1	Liberty Park	D	D	D	C	C	C	C	C	C	C	C	C					
33-2	E. U-District - Complete																	
34-1	Lee	P	P	D	D	D	D	C	C	C	C	C	C					
34-2	Underhill – Complete																	
34-3	20 th & Ray – Complete																	
41	Minnehaha	P	D	D	D	D	C	C										
I-03	TJ Meenach NW Blvd	D	D	D	D	D	C	C	C	C	C	C						
I-04	Bosch’s Lot	D	C	C	C	C	C											
I-07	Napa	D	C	C	C	C	C	C	C	C	C	C						
Legend:								P	Planning Phase				D	Design phase		C	Construction phase	

Section 4: Monitoring Programs and Monitoring Results

This section provides an overview of the City of Spokane's precipitation and flow monitoring programs, and presents results for 2016, including a summary of precipitation, CSO overflow details, a history of overflow frequencies, volume, and duration, and also a summary of the CSO outfalls that meet the CSO control standard.

4.1 CSO SYSTEM BASELINE CONDITIONS

As of 2000, there were 24 permitted outfalls associated with the City of Spokane's combined sewer collection system. As of the end of 2016, there are 20 outfalls remaining. These are identified in the City's NPDES Permit No. WA-002447-3 and are listed as follows:

TABLE 4-1: 2016 CSO OUTFALLS FROM THE NPDES PERMIT		
Outfall Number	Overflow Structure & Regulator Location Description	Outfall Location Reference
Discharges to Spokane River (North Bank)		
002	A.L. White @ Hartley (Extended)	0.5 miles downstream of WWTP
006	Kiernan @ NW Blvd	0.25 miles upstream of WWTP
007	Columbia Cir @ Downriver Park Dr	0.4 miles upstream of WWTP
010	Cochran @ Buckeye	At T.J. Meenach Bridge
012	Nora @ Pettet Dr	0.55 miles upstream of T.J. Meenach Bridge
014	Sherwood @ Summit	2.0 miles upstream of T.J. Meenach Bridge
015	Ohio @ Nettleton	2.5 miles upstream of T.J. Meenach Bridge
Discharges to Spokane River (South Bank)		
016	'A' @ Linton – Geiger	1.45 miles downstream of Monroe St Dam
Discharges to Latah Creek		
019	Seventh @ Inland Empire Way	At High Bridge (East Side)
020	High Drive between 33 rd and 37 th	2.65 miles upstream of Avista Bridge
Discharges to Spokane River (South Bank)		
022	Main @ Oak	0.7 miles downstream of Monroe St Dam
Discharges to Spokane River (North Bank)		
023	Cedar @ Ide	0.3 miles downstream of Monroe St Dam
Discharges to Spokane River (South Bank)		
024	Cedar @ Riverside (2)	0.3 miles downstream of Monroe St Dam
025	Cedar @ Main	0.3 miles downstream of Monroe St Dam
026	Lincoln @ Spokane Falls Blvd	At Monroe St Bridge
033	Fifth @ Arthur Third @ Perry Third @ Arthur First @ Arthur	0.15 miles upstream of J. Keefe Bridge
034	Crestline @ Riverside	At Trent Bridge
038	Magnolia @ S Riverton	0.15 miles upstream of Mission
039	Altamont @ S Riverton	0.75 miles downstream of Greene (Eliminated December 2012)
040	Regal @ S Riverton	0.25 miles downstream of Greene (Eliminated December 2012)
Discharges to Spokane River (North Bank)		
041	Rebecca @ Upriver Dr	0.5 miles upstream of Greene
Discharges to Spokane River (South Bank)		
042	Surro Dr	1.1 miles upstream of Greene

In the March 2014 CSO Plan Amendment, baseline conditions were updated using a 20-year precipitation dataset and flow monitoring data. Table 4-2 includes the original baseline conditions, and the updated baseline conditions generated from flow monitoring during the ten-year period of 2003 through 2012.

**TABLE 4-2: BASELINE AVERAGE ANNUAL CSO VOLUMES AND FREQUENCIES
ORIGINAL 1979-1988 AND REVISED 2003 – 2012**

CSO No.	CSO Location	1979 – 1988 Average Annual Overflow Volume (MG) ¹	2003-2012 Average Annual Overflow Volume (MG)	1979-1988 Average Annual Overflow Frequency	2003-2012 Average Annual Overflow Frequency
2	NW Blvd. @ Hartley	1.72 ²	0 ²	40 ²	0 ²
3b	NW Blvd. @ Assembly	0.00 ²	N/A ²	1 ²	N/A ²
3c	NW Blvd. @ Assembly	1.94 ²	N/A ²	51 ²	N/A ²
6	Kiernan @ NW Blvd.	14.12	4.81	34	27
7	Columbia Circle	0.81	0.32	13	11
10	Cochran @ Buckeye	0.27	0.15	7	10
12	Nora @ Pettet	9.65	3.50	35	28
14	Sherwood @ Summit	0.86	0.11	17	14
15	Nettleton @ Ohio	4.47	0.20	34	9
16a	"A" St. @ Linton	0.01 ³	N/A ³	0 ³	N/A ³
16b	"A" St. @ Linton	0.50 ³	0.21 ³	12 ³	6 ³
18	1 st St. @ "A" St.	0.00 ³	N/A ³	1 ³	N/A ³
19	Under FW Bridge	0.00	0.00	0	<1
20	High Dr. near 33 rd	0.55	0.03	3	<1
22	Main @ Oak St.	0.00	0.03	0	1
23	Cedar @ Ide	1.69	1.07	18	16
24a	Cedar @ Riverside	2.12	8.00	3	20
24b	Cedar @ Riverside	0.00	0.10	0	10
25	Cedar @ Main	0.35	0.42	19	22
26	Lincoln @ Spokane Falls	19.73	16.41	15	24
33a	5 th @ Arthur	0.00	0.04	0	8
33b	3 rd @ Perry	2.30	6.72	5	7
33c	3 rd @ Arthur	0.12	0.04	11	6
33d	1 st @ Arthur	2.03	0.42	42	23
34	Riverside @ Napa/Crestline	11.78	13.82	13	19
38	Magnolia @ S. Riverton	0.28 ⁴	0.08 ⁴	10 ⁴	10 ⁴
39	Altamont @ S. Riverton	1.06 ⁴	0.06 ⁴	34 ⁴	4 ⁴
40	Regal @ S. Riverton	1.45 ⁴	0.06 ⁴	32 ⁴	7 ⁴
41	Rebecca @ Upriver Dr.	0.52	0.39	11	12
42	Surro @ S. Riverton	0.31	0.02	7	2
Total		78.64	56.99	467	296

¹ With snowmelt.

² CSO 2 & 3c flows are consolidated and regulated at CSO 2&3c Control Facility to overflow no more than once per year on average via Outfall 2. CSO 3b regulator is physically eliminated and outfall is now separated storm only.

³ CSO 16a, 16b & 18 flows are consolidated and regulated at CSO 16/18 Control Facility to overflow no more than once per year on average via Outfall 16b. Outfalls 16a and 18 are physically disconnected.

⁴ CSO 38, 39 and 40 flows are consolidated and regulated at the CSO 38/39 Control facility to overflow no more than once per year on average via Outfall 38. Outfalls 39 and 40 are physically disconnected.

4.2 PRECIPITATION MONITORING PROGRAM

The City of Spokane collects precipitation data from 11 rain gauges around the City. Five of those gauges have been in place since 1996, and provide a 20-year basis for precipitation modeling and validation of sewer models. The data has been collected in a 1-minute resolution since mid-2000. Because of the quality of the rain data, the City has a high degree of confidence in the modeling results and sizing of the CSO facilities.

2016 was slightly wetter than average for the region with 18.30 inches measured at the Spokane Airport. However, 2016 did have one extreme event and one record-breaking month. Taken together, these events contributed 68.7% of the total volume of Combined Sewer Overflows for an otherwise slightly wet year.

- On May 21, 2016, a thunderstorm stalled over the Indian Trail area, dumping in excess of 3 inches within two hours. This event contributed to a combined 9.7 million gallons of sewage that overflowed to the Spokane River.
- October 2016 was the wettest October on record since Spokane began recording precipitation back in 1881. The 6.23 inch record for the month easily surpassed the 5.41 inch record set back in 1947. The results of this record rainfall contributed to a combined 45.4 million gallons of sewage overflowing into the Spokane River.

TABLE 4-3: 2016 PRECIPITATION BY GAUGE BY MONTH (INCHES)

Rain Gauge	January	February	March	April	May	June	July	August	September	October	November	December
1004	2.62	0.81	3.39	0.40	1.25	0.73	0.40	0.05	0.27	6.93	1.55	0.47E
343	2.13	1.02	3.6	0.99	1.78	0.78	0.40	0.25	0.42	6.90	1.98	0.41
344	3.95	0.71	3.22	0.78	1.20	0.74	0.30	0.16	0.37	6.69	1.62	0.72
Shadle	2.95	0.66	3.10	0.63	2.31	0.49	0.34	0.10	0.24	6.23	1.42	0.64
Hartson	2.10	0.83	3.45	0.97	1.98	0.71	0.57	0.20	0.30	6.34	1.55	0.78
City Hall	2.21	0.6	3.15	0.69	1.34	0.60	0.47	0.18	0.22	6.38	1.21	X
Joe Albi	2.24	0.61	3.15	0.48	2.26	0.45	0.46	0.06	0.36	6.28	1.43	1.00
Rockwood Vista	X	1.33E	4.38E	1.30	2.39	0.94	0.76	0.33	0.36	9.05E	2.31	1.64
Station 8	1.84	0.59	2.88	0.66	1.87	0.71	1.2	0.08	0.28	6.44	1.32	0.89
West Drive	3.90	0.77	3.68	0.56	1.07	0.71	0.33	0.14	0.27	6.77	1.68	0.88
Nora & Pettet	4.52	0.64	3.76	0.67	1.58	0.63	0.4	0.25	0.21	6.42	1.48	0.74
GEG	2.74	0.72	3.30	0.32	0.78	0.51	0.27	0.16	0.21	6.23	1.57	1.49
NWS - Spokane	2.62	0.72	3.62	0.47	1.07	0.91	0.39	0.08	0.35	6.92	1.85	1.60
Felts Field	2.32	0.8	3.22	0.65	1.64	0.80	1.31	0.07	0.36	6.22	1.58	1.29
Month Average	2.78*	0.73*	3.35*	0.68	1.61	0.69	0.54	0.15	0.30	6.52*	1.61	1.01*

X – Rain gauge out of service for part or whole month.

E – Rain gauge value for part of the month in error; underreporting or overreporting.

* – Rain gauge service interruptions and errors not included in monthly average.

4.3 FLOW MONITORING PROGRAM AND SUMMARY OF RESULTS

During 2016, Spokane's flow monitoring employees operated and maintained 31 CSO flow monitoring sites, 4 stormwater and CSO sampling sites, and 50 other flow monitoring sites for a total of 85 sites throughout the collection system.

A team of monitoring staff regularly review the flow monitoring results, evaluate the quality of the incoming data and the performance of each flow monitor site. The team performs maintenance when a flow monitor indicates erroneous data or is not reporting data on a timely schedule. Early warning alarms are monitored 24 hours per day by the Operations group at RPWRF and referred to the flow monitoring team and sewer maintenance crews for maintenance. Overflow alarms are monitored 24 hours per day and confirmed alarms are posted to the City's public notification web site.

On a monthly basis, an analyst and the flow monitoring team review the monthly report data. False positives are eliminated from the data, and data that is in error is estimated from alternative or redundant monitoring points. Any problematic rain gauges and flow monitoring sites with an increase in missing or erroneous data are reviewed by the team to suggest improvements to the flow monitoring site to increase the quality of the data.

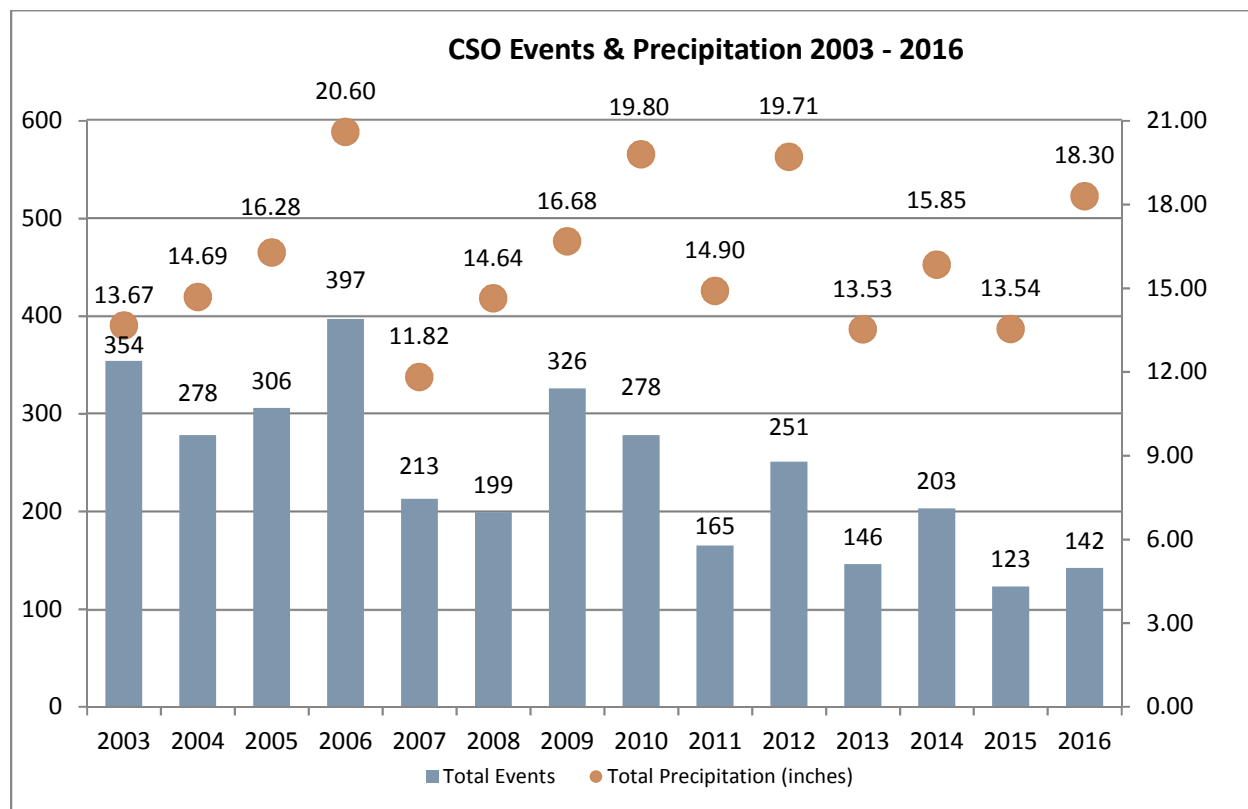


FIGURE 4-4: 2003 – 2016 CSO EVENTS & PRECIPITATION

As the City of Spokane's rainfall varies from year to year, the amount of rain and the variability in the intensity of rainstorms introduce a high degree of variability in the number of CSO overflow events. As the City of Spokane continues to install control facilities, the number of overflow events has generally been reduced. In 2016, rainfall was above the annual average and the annual number of overflow events was below the 2003-2012 baseline.

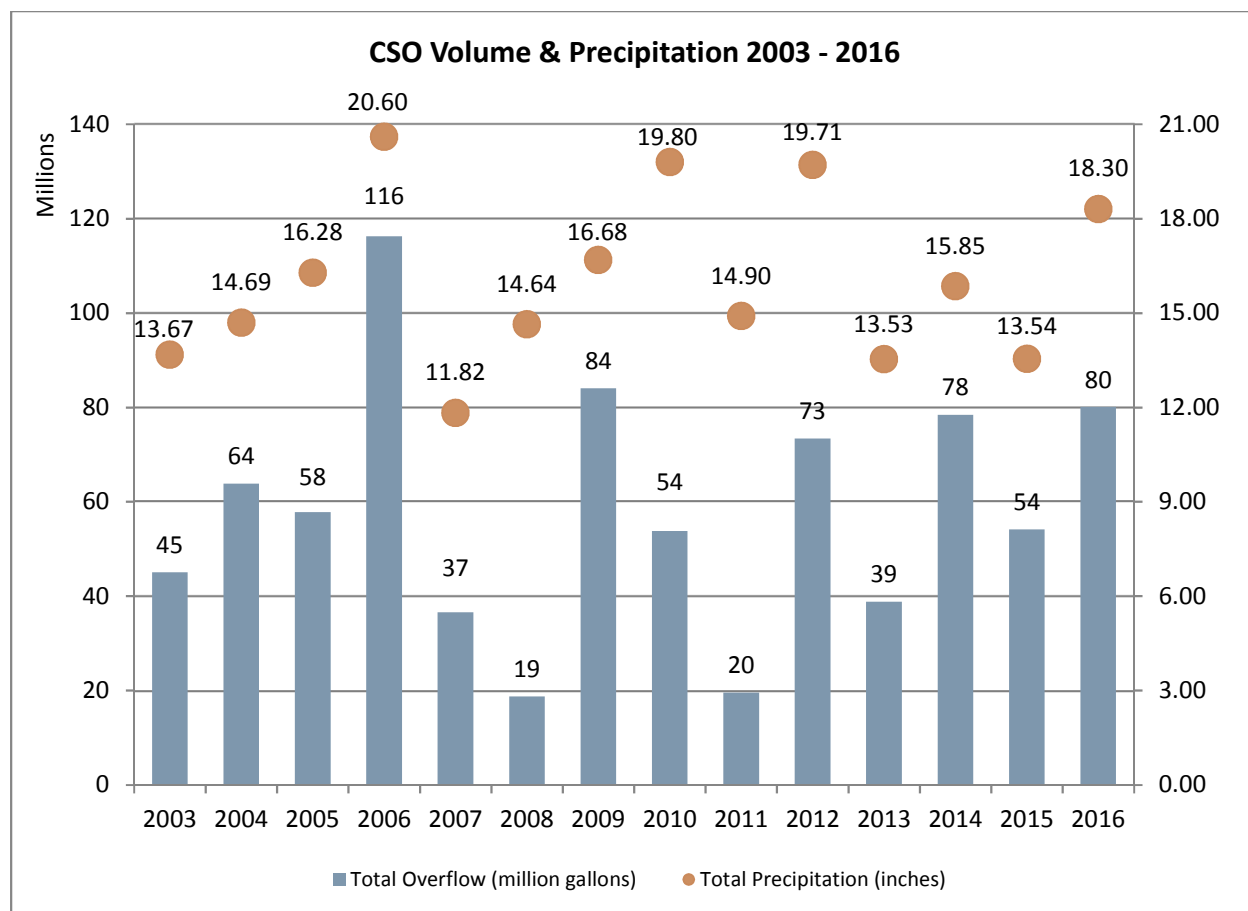
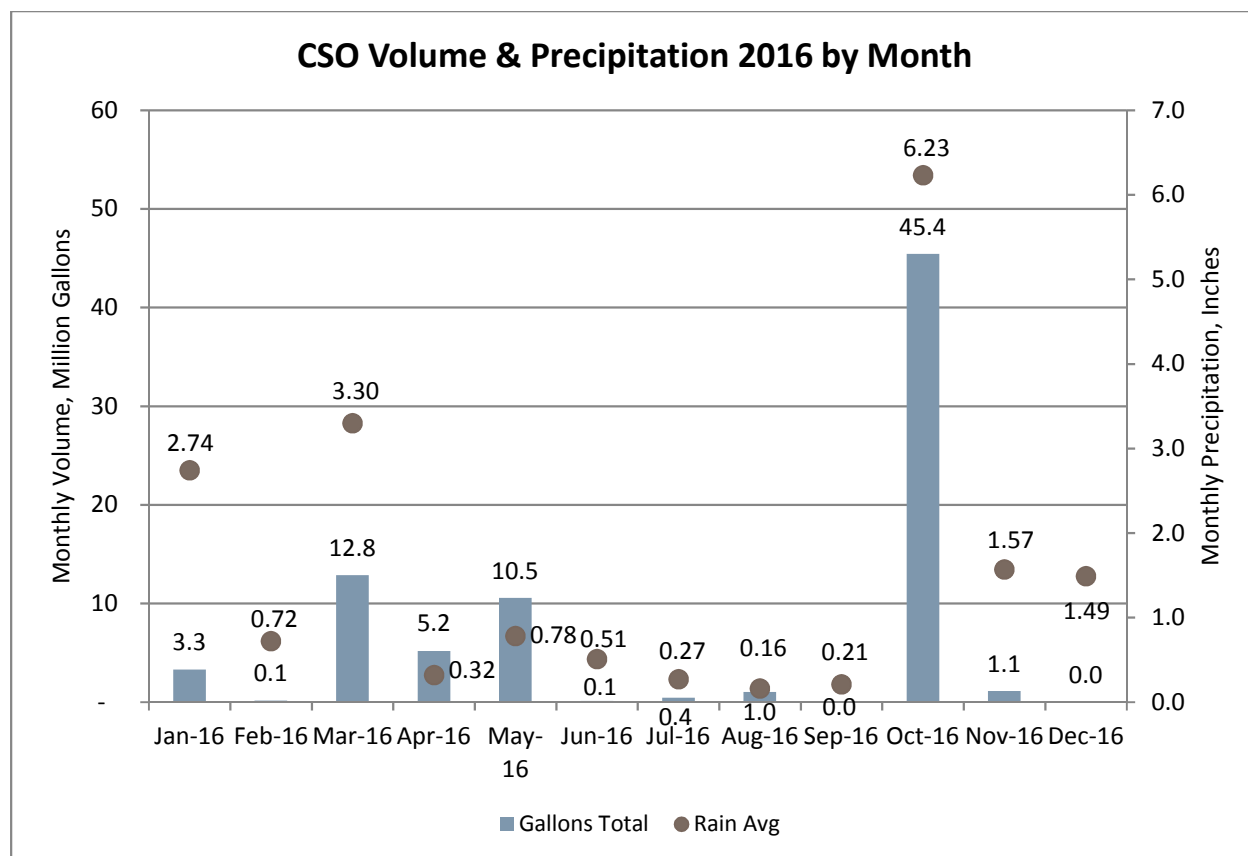


FIGURE 4-5: 2003 – 2016 CSO VOLUME & PRECIPITATION

As the City of Spokane's rainfall varies from year to year, the amount of rain and the variability in the intensity of rainstorms introduce a high degree of variability in the volume of CSO overflows. In 2016, rainfall was above the annual average, and the volume of overflows was above the 2003 – 2012 baseline average. 2016 had a significant thunderstorm event and a record month for precipitation in October that contributed to excess overflows. The volume of overflows is expected to decline as future system improvements are constructed.


FIGURE 4-6: MONTHLY CSO VOLUMES & PRECIPITATION FOR 2016

In accordance with the requirements of the City of Spokane's NPDES Permit concerning combined sewer overflow discharges, summarized below are the frequencies, volumes and durations of CSO events recorded from January 1 through December 31, 2016. It is estimated that a **total of 80 million gallons** of combined sewage discharged to local receiving waters over these twelve months. All of these discharges were associated with snowmelt and/or rain events and distributed across 12 of the 22 permitted CSO outfalls. Discharges at the remaining seven (7) priority CSO regulator sites accounted for 67 percent of the total overflow volume measured.

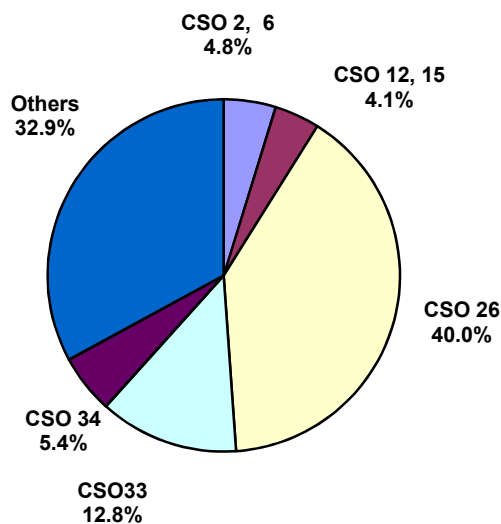

FIGURE 4-7: PERCENTAGE OF FLOW THROUGH SEVEN REMAINING PRIORITY SITES

TABLE 4-8: SUMMARY OF MONITORED CSO FREQUENCIES & VOLUMES FOR 2016

CSO OUTFALL	UPSTREAM REGULATOR ID ¹	MONITORED CSO VOLUME (gallons)	MONITORED CSO FREQUENCY (Occurrences)	MONITORED CSO DURATION (minutes)
02	02	0	0	0
06	06	3,820,642	2	1,010
07	07	120,464	3	45
10	10	0	0	0
12	12	3,322,958	19	2,400
14	14	57,852	6	280
15	15	0	0	0
16	16	0	0	0
19	19	0	0	0
20	20	0	0	0
22	22B	0	0	0
23	23	80,175	5	515
24	24A	24,942,021	17	4,820
	24B	9,875	5	125
	Total ² :	24,951,896	17	
25	25	464,077	18	1,270
26	26	32,016,230	26	6,715
33	33A	58,605	11	550
	33B	9,688,907	7	815
	33C	162,791	14	830
	33-2	333,187	1	350
	Total ² :	10,243,490	14	
34	34	4,341,368	15	2,035
38	38	0	0	0
39	39	Outfall Eliminated December 2012		
40	40	Outfall Eliminated December 2012		
41	41	585,913	16	1,620
42	42	0	0	0
RPWRF ³	RPWRF ³	114,000	1	56
TOTAL:		80,119,065	142	23,436

1. Nine (9) priority flow monitoring sites identified in **BOLDFACE** type. CSO 3C was formerly a priority site, but is now associated with CSO Outfall 2.
2. Frequency reflects any simultaneous overflows from multiple regulators to a common outfall.
3. NPDES Permit Section 13.H requires reporting date, duration, and volume of CSO-Related bypasses at RPWRF.

TABLE 4-9: CSO OVERFLOWS CURRENTLY MEETING ANNUAL OVERFLOW FREQUENCY PERFORMANCE STANDARD																						
Outfall NPDES Number	Reported Number of Overflows per Year																Average Annual Overflow Frequency			Currently Meets Annual Overflow Frequency Performance Standard	Comments	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2003 - 2012 Benchmark	Monitored			With Facility
002	0	3	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0.00	Yes	Operational since 2003
003	0	8	16	0														0	N/A	N/A	N/A	Outfall eliminated in 2003
006	3	17	27	24	32	23	35	23	21	27	30	21	30	22	28	17	2	27	23.69	--	No	Weir modified in 2008; Facility Constructed Dec 2015; final regulator setting not in place
007	NM	8	10	14	11	15	18	9	6	13	11	5	7	3	6	6	3	11	9.06	--	No	Weir modified in 2008; Facility Constructed Dec 2015; final regulator setting not in place
010	0	8	11	10	7	13	17	8	6	12	13	8	1	0	0	0	0	10	7.16	0.20	Yes	Operational since 2011
012	10	23	29	34	31	26	39	25	22	32	33	15	23	15	19	11	19	28	24.75	--	No	Weir modified in 2009
014	NM	NM	11	20	11	21	36	17	16	18	1	0	3	0	2	5	6	14	11.13	--	No	Weir modified in 2009; Measurements began in 2002
015	1	5	9	11	10	14	17	5	9	12	2	3	2	0	2	0	0	9	6.31	--	No	Weir modified in 2009
016	NM	0	6	11	9	14	16	5	0	0	0	0	0	0	0	0	0	6	3.81	0.00	Yes	Operational since 2007
018	NM																	N/A	N/A	N/A	N/A	Outfall eliminated before 2000
019	NM	0	0	0	1	0	1	2	0	1	0	0	0	0	0	0	0	<1	0.31	0.00	Yes	Operational since 2010
020	NM	NM	NM	NM	1	0	0	0	0	1	0	0	2	0	2	1	0	<1	0.54	0.00	Yes	Measurements began in 2004; Operational January 2016
022	0	1	5	2	3	1	1	1	2	0	0	0	0	0	1	1	0	1	1.13	--	No	Influenced by CSO 25
023	3	16	20	20	17	18	28	18	16	17	16	0	12	1	7	6	5	16	13.56	--	No	
024	5	15	33	33	19	27	31	16	15	20	28	22	29	18	24	12	17	24	22.44	--	No	
025	NM	0	5	44	19	18	31	15	17	20	20	16	22	15	20	10	18	22	18.13	--	No	Weir modified in 2008
026	4	16	20	24	20	20	33	16	20	27	30	21	33	21	28	16	26	24	23.19	--	No	Weir modified before 2000
033	7	34	38	38	22	36	33	21	14	24	25	19	29	18	25	15	14	25	25.31	--	No	
034	2	15	18	18	19	14	27	11	16	24	17	17	24	21	22	12	15	19	18.13	--	No	
038	1	9	10	14	12	6	8	7	4	14	16	3	17	0	0	0	0	10	7.50	0.00	Yes	Operational since 2012
039	1	3	2	5	5	9	4	3	2	4	8	1	2					4	N/A	N/A	N/A	Weir modified in 2010; Outfall eliminated Dec 2012
040	5	17	19	21	17	9	6	4	4	6	6	1	0					7	N/A	N/A	N/A	Weir modified in 2010; Outfall eliminated Dec 2012
041	NM	0	9	10	12	12	13	7	7	13	22	13	15	12	17	11	16	12	11.81	--	No	
042	0	1	0	0	0	10	3	0	2	0	0	0	0	0	0	0	0	2	1.07	0.00	Yes	Operational since 2009

TABLE 4-10 - 2016 CSO DETAILS BY REGULATOR AND DATE

Regulator Number	Receiving Water	Start Date	Volume (Gallons)	Duration (Hours)	Precipitation (Inches)	Storm Duration (Hours)
02	Spokane River	<i>There were no Combined Sewer Overflows from regulator 02 during 2016.</i>				
06	Spokane River	05/21/2016	2,577,746	9.92	1.37	83.80
		10/30/2016	1,242,896	6.92	2.66	180.30
		<i>Total</i>	<i>3,820,642</i>	<i>16.83</i>	<i>4.02</i>	<i>264.10</i>
		<i>Average</i>	<i>1,910,321</i>	<i>8.42</i>	<i>2.01</i>	<i>132.05</i>
07	Spokane River	04/29/2016	38,371	0.17	0.43	51.68
		05/21/2016	78,604	0.42	1.37	83.80
		10/20/2017	3,489	0.17	0.64	56.27
		<i>Total</i>	<i>120,464</i>	<i>0.75</i>	<i>2.43</i>	<i>191.75</i>
		<i>Average</i>	<i>40,155</i>	<i>0.25</i>	<i>0.81</i>	<i>63.92</i>
10	Spokane River	<i>There were no Combined Sewer Overflows from regulator 10 during 2016.</i>				
12	Spokane River	01/19/2016	139,551	2.33	1.90	298.20
		01/28/2016	76,350	2.50	0.59	75.20
		02/12/2016	23,991	0.50	0.34	88.38
		03/01/2016	139,796	1.00	0.37	18.73
		03/06/2016	50,105	1.42	0.59	58.55
		03/09/2016	130,562	3.50	0.53	32.95
		03/13/2016	53,176	0.67	0.49	46.60
		03/20/2016	341,003	3.58	0.95	84.07
		03/27/2016	98,808	1.00	0.46	52.87
		04/29/2016	273,431	1.17	0.43	51.68
		05/04/2016	21,416	0.42	0.14	13.42
		05/21/2016	212,799	4.42	1.37	83.80
		07/22/2016	4,040	0.17	0.21	29.70
		08/09/2016	17,277	0.42	0.16	18.28
		10/07/2016	80,459	1.58	1.50	140.33
		10/15/2016	159,628	3.33	1.94	138.08
		10/20/2016	312,071	2.50	0.64	56.27
		10/26/2016	1,181,114	9.17	2.66	180.30
		11/15/2016	7,381	0.33	0.63	123.37
		<i>Total</i>	<i>3,322,958</i>	<i>40.00</i>	<i>15.91</i>	<i>1,590.78</i>
		<i>Average</i>	<i>174,893</i>	<i>2.11</i>	<i>0.84</i>	<i>83.73</i>

TABLE 4-10 - 2016 CSO DETAILS BY REGULATOR AND DATE

Regulator Number	Receiving Water	Start Date	Volume (Gallons)	Duration (Hours)	Precipitation (Inches)	Storm Duration (Hours)
14	Spokane River	03/01/2016	2,670	0.25	0.37	18.73
		03/06/2016	3,097	0.25	0.59	58.55
		03/22/2016	144	0.08	0.95	84.07
		04/29/2016	12,207	0.42	0.43	51.68
		10/20/2016	11,739	0.67	0.64	56.27
		10/30/2016	27,995	3.00	2.66	180.30
		<i>Total</i>	<i>57,852</i>	<i>4.67</i>	<i>5.64</i>	<i>449.60</i>
		<i>Average</i>	<i>9,642</i>	<i>0.78</i>	<i>0.94</i>	<i>74.93</i>
15	Spokane River	<i>There were no Combined Sewer Overflows from regulator 15 during 2016.</i>				
16B	Spokane River	<i>There were no Combined Sewer Overflows from regulator 16B during 2016.</i>				
19	Latah Creek	<i>There were no Combined Sewer Overflows from regulator 19 during 2016.</i>				
20	Latah Creek	<i>There were no Combined Sewer Overflows from regulator 20 during 2016.</i>				
22B	Spokane River	<i>There were no Combined Sewer Overflows from regulator 22B during 2016.</i>				
23	Spokane River	03/01/2016	2,536	0.58	0.37	18.73
		03/21/2016	5,923	1.33	0.95	84.07
		04/29/2016	24,619	1.00	0.43	51.68
		10/20/2016	9,914	1.08	0.64	56.27
		10/30/2016	37,183	4.58	2.66	180.30
		<i>Total</i>	<i>80,175</i>	<i>8.58</i>	<i>5.05</i>	<i>391.05</i>
		<i>Average</i>	<i>16,035</i>	<i>1.72</i>	<i>1.01</i>	<i>78.21</i>

TABLE 4-10 - 2016 CSO DETAILS BY REGULATOR AND DATE

Regulator Number	Receiving Water	Start Date	Volume (Gallons)	Duration (Hours)	Precipitation (Inches)	Storm Duration (Hours)
24A	Spokane River	01/19/2016	585,424	4.83	1.90	298.20
		01/28/2016	502,322	5.92	0.59	75.20
		02/12/2016	2,888	0.25	0.34	88.38
		03/01/2016	762,986	1.67	0.37	18.73
		03/06/2016	91,930	1.92	0.59	58.55
		03/09/2016	759,761	4.42	0.53	32.95
		03/20/2016	1,535,898	5.08	0.95	84.07
		03/27/2016	175,529	1.08	0.46	52.87
		04/29/2016	1,024,535	2.08	0.43	51.68
		05/21/2016	1,441,962	3.83	1.37	83.80
		08/09/2016	139,796	0.75	0.16	18.28
		10/07/2016	1,107,779	9.75	1.50	140.33
		10/13/2016	1,172,789	11.83	1.94	138.08
		10/20/2016	2,423,272	3.58	0.64	56.27
		10/26/2016	12,906,874	20.17	2.66	180.30
		11/15/2016	299,227	2.75	0.63	123.37
		11/23/2016	9,049	0.42	0.22	7.25
		<i>Total</i>	<i>24,942,021</i>	<i>80.33</i>	<i>15.28</i>	<i>1,508.32</i>
		<i>Average</i>	<i>1,467,178</i>	<i>4.73</i>	<i>0.90</i>	<i>88.72</i>
24B	Spokane River	03/01/2016	285	0.17	0.37	18.73
		03/21/2016	988	0.17	0.95	84.07
		04/29/2016	1,875	0.33	0.43	51.68
		08/09/2016	2,653	0.50	0.16	18.28
		10/30/2016	4,074	0.92	2.66	180.30
		<i>Total</i>	<i>9,875</i>	<i>2.08</i>	<i>4.57</i>	<i>353.07</i>
		<i>Average</i>	<i>1,975</i>	<i>0.42</i>	<i>0.91</i>	<i>70.61</i>
24 (Total)	Spokane River	<i>Total</i>	<i>24,951,896</i>	<i>80.33</i>	<i>15.28</i>	<i>1508.32</i>
		<i>Average</i>	<i>2,079,325</i>	<i>3.75</i>	<i>0.90</i>	<i>84.61</i>

TABLE 4-10 - 2016 CSO DETAILS BY REGULATOR AND DATE

Regulator Number	Receiving Water	Start Date	Volume (Gallons)	Duration (Hours)	Precipitation (Inches)	Storm Duration (Hours)
25	Spokane River	01/19/2016	13,634	0.75	1.90	298.20
		01/29/2016	1,068	0.17	0.59	75.20
		02/12/2016	6,283	0.25	0.34	88.38
		03/01/2016	17,236	0.67	0.37	18.73
		03/09/2016	8,822	1.75	0.53	32.95
		03/13/2016	9,414	0.42	0.49	46.60
		03/20/2016	41,611	2.92	0.95	84.07
		03/27/2016	7,162	0.33	0.46	52.87
		04/29/2016	40,403	1.08	0.43	51.68
		05/04/2016	1,615	0.17	0.14	13.42
		05/21/2016	20,023	2.08	1.37	83.80
		07/22/2016	6,194	0.25	0.21	29.70
		08/09/2016	12,928	0.58	0.16	18.28
		10/05/2016	7,732	1.00	1.50	140.33
		10/15/2016	2,770	0.25	1.94	138.08
		10/20/2016	31,689	1.08	0.64	56.27
		10/30/2016	162,370	7.25	2.66	180.30
		11/14/2016	73,123	0.17	0.63	123.37
		<i>Total</i>	<i>464,077</i>	<i>21.17</i>	<i>15.32</i>	<i>1,532.23</i>
		<i>Average</i>	<i>25,782</i>	<i>1.18</i>	<i>0.85</i>	<i>85.12</i>

TABLE 4-10 - 2016 CSO DETAILS BY REGULATOR AND DATE

Regulator Number	Receiving Water	Start Date	Volume (Gallons)	Duration (Hours)	Precipitation (Inches)	Storm Duration (Hours)
26	Spokane River	01/13/2016	1,022,290	9.75	1.90	298.20
		01/28/2016	871,993	8.42	0.59	75.20
		02/12/2016	95,872	0.58	0.34	88.38
		02/18/2016	11,493	0.42	0.32	51.62
		03/01/2016	1,145,640	2.00	0.37	18.73
		03/05/2016	636,051	5.17	0.59	58.55
		03/09/2016	1,508,379	5.00	0.53	32.95
		03/13/2016	584,377	1.50	0.49	46.60
		03/20/2016	2,702,303	7.08	0.95	84.07
		03/27/2016	600,166	1.50	0.46	52.87
		04/29/2016	2,143,258	2.42	0.43	51.68
		05/04/2016	156,294	0.50	0.14	13.42
		05/21/2016	2,394,338	7.17	1.37	83.80
		06/10/2016	108,120	1.17	0.35	35.32
		06/24/2016	3,318	0.83	0.19	12.73
		07/09/2016	4,689	0.33	0.18	31.48
		07/16/2016	48,375	0.33	0.06	5.12
		07/22/2016	100,534	0.42	0.21	29.70
		08/09/2016	857,746	0.92	0.16	18.28
		10/04/2016	1,813,193	10.67	1.50	140.33
		10/13/2016	2,516,448	18.58	1.94	138.08
		10/20/2016	2,258,702	3.17	0.64	56.27
		10/26/2016	9,706,506	18.00	2.66	180.30
		11/15/2016	613,179	3.58	0.63	123.37
		11/23/2016	77,501	1.50	0.22	7.25
		11/27/2016	35,465	0.92	0.40	86.67
		<i>Total</i>	<i>32,016,230</i>	<i>111.92</i>	<i>17.63</i>	<i>1,820.97</i>
		<i>Average</i>	<i>1,231,393</i>	<i>4.30</i>	<i>0.68</i>	<i>70.04</i>

TABLE 4-10 - 2016 CSO DETAILS BY REGULATOR AND DATE

Regulator Number	Receiving Water	Start Date	Volume (Gallons)	Duration (Hours)	Precipitation (Inches)	Storm Duration (Hours)
33A	Spokane River	03/01/2016	2,597	0.42	0.37	18.73
		03/13/2016	1376	0.25	0.49	46.60
		03/21/2016	2,117	0.42	0.95	84.07
		03/27/2016	184	0.08	0.46	52.87
		04/29/2016	12,445	1.25	0.43	51.68
		05/21/2016	9,427	0.92	1.37	83.80
		07/16/2016	1,649	0.25	0.06	5.12
		10/10/2016	210	0.08	1.50	140.33
		10/18/2016	518	0.17	1.94	138.08
		10/20/2016	7,079	0.92	0.64	56.27
		10/30/2016	21,003	4.42	2.66	180.30
		<i>Total</i>	<i>58,605</i>	<i>9.17</i>	<i>10.87</i>	<i>857.85</i>
		<i>Average</i>	<i>5,328</i>	<i>0.83</i>	<i>0.99</i>	<i>77.99</i>
33B	Spokane River	03/01/2016	425,971	0.50	0.37	18.73
		03/13/2016	76,073	0.25	0.49	46.60
		03/22/2016	364,056	0.67	0.95	84.07
		04/29/2016	1,224,057	1.25	0.43	51.68
		05/21/2016	1,484,580	3.00	1.37	83.80
		10/20/2016	884,913	1.33	0.64	56.27
		10/30/2016	5,229,257	6.58	2.66	180.30
		<i>Total</i>	<i>9,688,907</i>	<i>13.58</i>	<i>6.90</i>	<i>521.45</i>
		<i>Average</i>	<i>1,384,130</i>	<i>1.94</i>	<i>0.99</i>	<i>74.49</i>
33C	Spokane River	03/01/2016	7,067	0.50	0.37	18.73
		03/13/2016	1,727	0.33	0.49	46.60
		03/21/2016	3,877	0.75	0.95	84.07
		03/27/2016	2,316	0.50	0.46	52.87
		04/29/2016	26,411	1.33	0.43	51.68
		05/04/2016	825	0.17	0.14	13.42
		05/21/2016	34,712	2.08	1.37	83.80
		07/16/2016	1,117	0.17	0.06	5.12
		07/22/2016	1,106	0.17	0.21	29.70
		08/09/2016	273	0.17	0.16	18.28
		10/10/2016	285	0.17	1.50	140.33
		10/18/2016	3,804	0.42	1.94	138.08
		10/20/2016	9,768	1.00	0.64	56.27
		10/30/2016	69,503	6.08	2.66	180.30
		<i>Total</i>	<i>162,791</i>	<i>13.83</i>	<i>11.39</i>	<i>919.25</i>
		<i>Average</i>	<i>11,628</i>	<i>0.99</i>	<i>0.81</i>	<i>65.66</i>

TABLE 4-10 - 2016 CSO DETAILS BY REGULATOR AND DATE

Regulator Number	Receiving Water	Start Date	Volume (Gallons)	Duration (Hours)	Precipitation (Inches)	Storm Duration (Hours)
33-2	Spokane River	10/30/2016	333,187	5.83	2.66	180.30
		<i>Total</i>	<i>333,187</i>	<i>5.83</i>	<i>2.66</i>	<i>180.30</i>
		<i>Average</i>	<i>333,187</i>	<i>5.83</i>	<i>2.66</i>	<i>180.30</i>
33 (Total)	Spokane River	<i>Total</i>	<i>4,965,543</i>	<i>50.75</i>	<i>9.61</i>	<i>860.15</i>
		<i>Average</i>	<i>331,036</i>	<i>3.38</i>	<i>0.64</i>	<i>57.34</i>
34	Spokane River	01/17/2016	53,148	2.00	1.90	298.20
		01/28/2016	22,623	2.00	0.59	75.20
		03/01/2016	188,586	1.25	0.37	18.73
		03/09/2016	54,223	3.42	0.53	32.95
		03/13/2016	79,364	1.00	0.49	46.60
		03/22/2016	116,722	2.00	0.95	84.07
		03/27/2016	50,759	0.92	0.46	52.87
		04/29/2016	353,075	1.67	0.43	51.68
		05/21/2016	2,023,833	6.58	1.37	83.80
		07/22/2016	141,829	0.83	0.21	29.70
		10/10/2016	3,326	0.58	1.50	140.33
		10/15/2016	75,510	2.83	1.94	138.08
		10/20/2016	566,078	2.83	0.64	56.27
		10/26/2016	612,057	5.50	2.66	180.30
		11/15/2016	235	0.50	0.63	123.37
		<i>Total</i>	<i>4,341,368</i>	<i>33.92</i>	<i>14.67</i>	<i>1,412.15</i>
		<i>Average</i>	<i>289,425</i>	<i>2.26</i>	<i>0.98</i>	<i>94.14</i>
38	Spokane River	There were no Combined Sewer Overflows from regulator 38 during 2016.				

TABLE 4-10 - 2016 CSO DETAILS BY REGULATOR AND DATE

Regulator Number	Receiving Water	Start Date	Volume (Gallons)	Duration (Hours)	Precipitation (Inches)	Storm Duration (Hours)
41	Spokane River	01/17/2016	10,398	1.17	1.90	298.20
		01/29/2016	394	0.33	0.59	75.20
		02/12/2016	117	0.08	0.34	88.38
		03/01/2016	14,966	0.83	0.37	18.73
		03/10/2016	239	0.42	0.53	32.95
		03/13/2016	7,276	0.75	0.49	46.60
		03/22/2016	24,935	1.00	0.95	84.07
		03/27/2016	4,897	0.58	0.46	52.87
		04/29/2016	7,339	0.67	0.43	51.68
		05/21/2016	85,724	4.75	1.37	83.80
		07/22/2016	110,575	1.00	0.21	29.70
		10/07/2016	7,988	1.08	1.50	140.33
		10/15/2016	8,350	1.67	1.94	138.08
		10/20/2016	65,497	2.58	0.64	56.27
		10/26/2016	235,948	9.67	2.66	180.30
		11/15/2016	1,273	0.42	0.63	123.37
		<i>Total</i>	<i>585,916</i>	<i>27.00</i>	<i>15.02</i>	<i>1,500.53</i>
		<i>Average</i>	<i>36,620</i>	<i>1.69</i>	<i>0.94</i>	<i>93.78</i>
42	Spokane River	<i>There were no Combined Sewer Overflows from regulator 42 during 2016.</i>				
RPWRF	Spokane River	10/31/2016	114,000	0.93	2.66	180.30
		<i>Total</i>	<i>114,000</i>	<i>0.93</i>	<i>2.66</i>	<i>180.30</i>
		<i>Average</i>	<i>114,000</i>	<i>0.93</i>	<i>2.66</i>	<i>180.30</i>

APPENDIX A: CSO O&M MANUAL

City of Spokane

OPERATIONS & MAINTENANCE PLAN

For

CSO Regulators and OUTFALLS

Table of Contents

Goal	Page 2
Awareness and Prevention	Page 2
Frequency of Inspection	Page 3
Routine Inspections	Page 3
Tank Inspection	Page 3
Stage II Snow Event Procedure	Page 4
High River Procedures	Page 4
Dry Weather Procedures	Page 4
DWO Maintenance Procedures	Page 4
Caution Signs & Flags	Page 5
Internal Notification Protocol	Page 5
Supervisor Procedures	Page 6
24 Hr Phone Notification to Ecology	Page 7
24 Hour Notification to County Health	Page 7
Post Event Inspection	Page 7
5 Day Written Report to Ecology	Page 7
Record Keeping	Page 8
Submission Dates	Page 8

GOAL:

The goal of this operations and maintenance plan is to properly manage the entire CSO regulator structures at all times and prevent/minimize any combined sewer overflows during dry weather (DWO's). This update accounts for weirs modified in 2008 (#6, #7, #25) 2009 (#12, #14, #15) 2010 (#19, and Control Facilities (tanks) 2/3, 16/18, 42, 10 & 38/39/40 as we upgrade from dams & leaping weirs to hydrosides. See comprehensive 6 year sewer program for future tank construction schedules.

Dam and leaping weir overflow occurs within the same manhole as the active sewer line. This style has potential to plug and overflow immediately to the river.

The modified weirs and tanks have storage areas before the overflow weir. This allows for some response time prior to the actual overflow.

AWARENESS AND PREVENTION:

- Wastewater Maintenance Atlas has the CSO regulator basin areas identified by shading and labeling, as to the immediate impact on the regulator through various maintenance procedures.
- Wastewater Crew member training to include these designated areas of immediate impact shall take place annually.
- All contract documents for our cured in place pipe program and any work upstream of regulator that could affect regulator shall include reference to the regulator and/or control device sites and strict notification to the contractor that mechanical measures must be taken to prevent any type of dry weather over flow from any and all work performed by the contractor.
- Maintenance and Construction procedures have been reviewed to include the feasibility of installing pneumatic plugs / sand bags during the course of routine work to prevent any type of dry weather overflow in designated areas.
- Training of Water Department Staff and other city staff that have the potential to cause a DWO.

FREQUENCY OF INSPECTION:

Routine Inspections:

Visual inspection or remote means by a Wastewater Specialist or CSO Instrument Technician for each CSO structure shall take place once a week, year around; unless maintenance history dictates a more frequent schedule is required. The City's CSO's are geographically split into those located north or south of the Spokane River (see weir check lists). Inspections shall include a visual check for any blockages, plugs, sticks, rocks or debris and be used to assess the overall operating condition. CSO monitoring alarm thresholds have been reviewed and, where feasible, lowered. Remote regular verification of CSO monitoring equipment and telemetry status from RPWRF has been implemented. Weekly visual inspections are accomplished along with continued monitoring. The exception to this schedule shall be on any regulator and/or control device that has been plugged; it is checked daily for five working days, and then checked once a week for a month, before returning to the regular schedule.

- Check all outfall pipes and down stream banks once monthly for signs of overflow.
- Check all sign condition once monthly, if damaged fix as soon as possible.
- As determined by remote monitoring, any CSO structure that overflows following the prior week check will have that outfall pipe checked. Down stream banks will be checked for sewage debris, and cleaned up.

Routine Tank Inspection

See the O & M manual and/or SOP for appropriate tank inspection checklist.

Visual inspection of each tank shall take place annually per each tank O&M procedures.

An intermediate event is when water gets in the flush tanks and/ or the tank. An extreme event is when the tank fills then overflows to the river.

If monitoring indicates the tanks have filled in an intermediate or extreme event, a follow-up visual inspection of tank components will take place within 7 days of the event.

Stage II Snow Event Procedures

Routine weekly visual inspections will be suspended during stage II snow events for access and safety reasons.

- Remote monitoring of CSO's will continue during the stage II event.

High River Procedures

For safety reasons, outfalls and downstream river bank inspections will be suspended when the river flows are above 25,000 cfs.

Dry Weather Procedures:

DWO procedures will be done year around. When notification of a possible dry weather overflow occurs Wastewater maintenance will:

- Inspect affected regulator and/or control device and return to normal operation

DWO MAINTENANCE PROCEDURES:

If the regulator and/or control device is overflowing, the crew will immediately try to dislodge any debris causing the blockage with the service truck pole. If this is unsuccessful, the crew will radio Wastewater Maintenance to get the closest available hydro cleaner to assist in clearing the blockage. The crew will continue to work with the pole to dislodge any debris until the hydro crew arrives. If the blockage is still not 100% clear from the regulator and/or

control device, the crew shall immediately notify the appropriate District Supervisor in order to enter the confined space; per the Wastewater Management confined space entry program and remove all foreign objects with hooks and shovels or by using a combination sewer cleaner with vacuum capabilities. (Note: If the debris cannot be removed expediently, it may be necessary to plug the sewer line and by-pass pump all the flow to another sanitary facility in the interim to remove all debris.) This practice shall be continued until the structure is flowing cleanly and there is no doubt that the regulator and/or control device is 100% free of any obstruction.

- Document the DWO on the complaint form.
- Try to identify the debris blocking weir
- Where possible state the size or amount of blockage

CAUTION SIGNS AND FLAGS:

During high river use, between April 15th and November 1, river entry point signage will also be displayed.

Flags and signage will not be displayed between November 2 and April 14th

- Flip open signage and install flags for 24 hrs at Plese Flats, TJ Menach and Water Ave river access points.
- Remove any sewage debris in the vicinity of the outfall within three days of any dry weather overflow,
- Check signage at outfall

INTERNAL NOTIFICATION PROTOCOL:

Notification of any plugged regulator and or control device shall be directed immediately, 24 hours a day, to Wastewater Maintenance (625-7900) and passed on to the appropriate supervisor;

After hours supervisor will contact RPWRF operator to give a point of contact. When resolved, supervisor will contact RPWRF operator on weir status.

- Dan Duffey Radio #326,
- Mal Lund Radio #330,
- Jim Mintague Radio #350,
- Mike Lowdon #331.

SUPERVISOR PROCEDURES:

In any Dry Weather Overflow (DWO) event, the Wastewater Maintenance and Collection Superintendent, Raylene Gennett, or responsible person shall notify external personnel as defined in the following section and notify the Director of Wastewater Management, Dan Kegley and the Director of Public Works Scott Simmons.

- Minimum information needed by supervisors for initial (24-hour) DWO notification is:
- Location and Regulator Number
- Time of notification to Wastewater Maintenance and/or time DWO was discovered
- Notify RPWRF Operator of overflow, as to activate public notification on the city website.

Additional information needed by supervisors for follow-up report due to DOE within 5 business days includes:

- Start and end times of DWO
- Duration of DWO (cumulative recorded overflow time)
- Estimated gallons of DWO calculated from a review of information provided by programmer analyst
- Pipe and weir sizes involved
- Description of Wastewater Management response, including timeline (alarm, validation, maintenance crew arrival, return to normal operation)
- Cause of DWO, if it can be determined
- Any special circumstances, such as vandalism, firefighting, water main break, damaged monitors or telemetry, etc.
- How we might prevent in the future, as applicable

24 HOUR PHONE NOTIFICATION TO ECOLOGY:

Wastewater Maintenance and Collection Superintendent, Raylene Gennett or responsible person shall verbally notify the Dept. of Ecology within 24 hours of the city becoming aware of a possible DWO event. **Such notification shall be to Ecology's 24-hour phone number 329-3400.** If during business hours, attempt to also notify the NPDES permit manager and enforcement coordinator at Ecology via that same phone number or by e-mail.

24 HOUR PHONE NOTIFICATION TO SPOKANE REGIONAL COUNTY HEALTH:

Wastewater Collection Supervisor, Raylene Gennett or responsible person shall verbally notify **Spokane Regional County Health (SRCH) 8am to 5:00 pm call 324-1560. After hours call 624- 4146.** During business hours attempt to notify Mike LaScuola at the 324-1574 within 24 hours of the city becoming aware of a possible DWO event.

POST EVENT INSPECTION:

Any regulator and/or control device that has been plugged;

- Check daily for five working days,
- Then check once a week for a month,
- If no signs of issues with regulator during the post inspections then return to the regular schedule.

5 DAY WRITTEN REPORT TO ECOLOGY:

Wastewater Maintenance and Collection Superintendent, Raylene Gennett or responsible person shall submit a written report documenting the DWO event. The written report shall be sent to the NPDES permit manager at Department of Ecology within five (5) business days per the notification plan.

RECORD KEEPING:

All monthly inspection reports shall be kept on file at Wastewater Maintenance. Regarding dry weather overflow events, a log of all radio communications during the event will be kept on file. All 5 day written reports for DWO events submitted to Ecology and shall be placed on file. When development of the Maintenance Management System is complete, the monthly CSO regulator inspection information shall be recorded electronically. The data shall reference the manhole identification number (I.D.) and CSO regulator number.

SUBMISSION DATES:

Previous year's weir, sign and outfall inspection reports shall be submitted by March 1st each year. (Reference NPDES Permit S.13.F)

Annual review of the CSO O&M Plan shall be submitted on October 1st of each year. (Reference NPDES Permit S.13.E)